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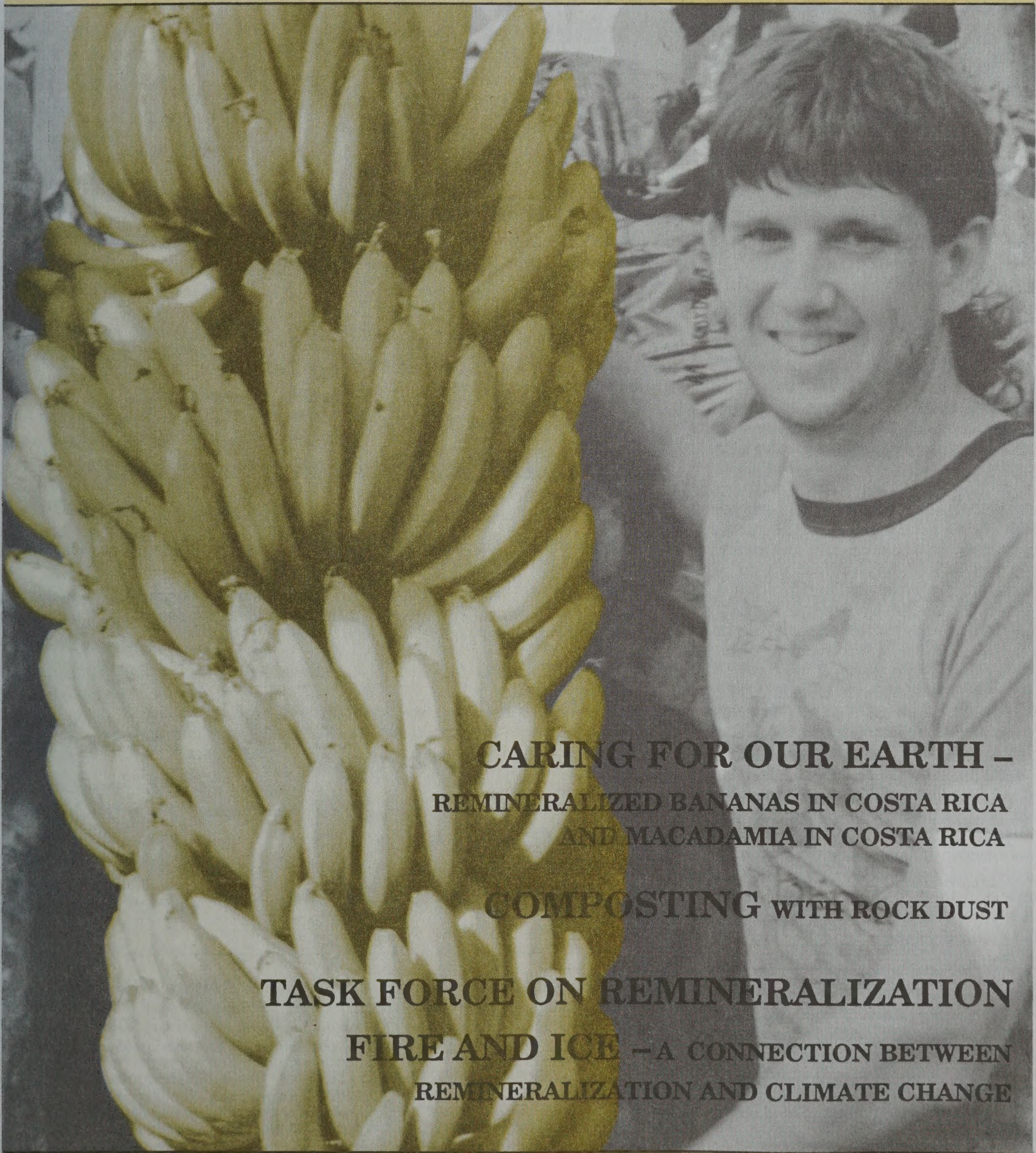
REMINERALIZE THE EARTH

Regenerating our soils, forests and health

RECYCLING MINERALS with finely ground gravel and rock dust

DOUBLE ISSUE 4-5

SPRING 1993 • NORTHERN HEMISPHERE



CARING FOR OUR EARTH –

REMINERALIZED BANANAS IN COSTA RICA AND MACADAMIA IN COSTA RICA

COMPOSTING WITH ROCK DUST

TASK FORCE ON REMINERALIZATION

FIRE AND ICE – A CONNECTION BETWEEN REMINERALIZATION AND CLIMATE CHANGE

FALL 1993 • SOUTHERN HEMISPHERE

formerly SOIL REMINERALIZATION NEWSLETTER

REMINERALIZE THE EARTH

Regenerating our soils, forests and health

Recycling minerals with finely ground gravel and rock dust

This magazine is a reflection, forum, round table of ideas, experiences and research of those concerned with networking and implementing soil remineralization. Articles, letters, and photos are welcome and appreciated. We reach an emerging grass roots community network around the world.

EDEN OR ICE AGE Which Will We Choose?

The book *The Survival of Civilization* by John Hamaker and Don Weaver is regarded by a growing movement worldwide as a blueprint for the survival of the Earth, restoring ecological balance and, perhaps, even recreating Eden.

The remineralization of forests, farms, orchards and gardens with glacial gravel and rock dust is nature's way to regenerate and fertilize soils. During an Ice Age, as glaciers grind rock to a fine dust over millennia, a fertile soil is created. Adding finely ground gravel dust to soils is a tremendous boost to organic agriculture and can make it truly viable by adding up to a hundred elements and trace minerals needed by all life and by nourishing the microorganisms in the soil, whose protoplasm is the basis of all living things.

There is evidence to suggest that as forests begin to die off worldwide, giving off carbon dioxide, the climate of the Earth is altered, triggering the transition from the warm interglacial to an Ice Age. We are hastening this process with the burning of fossil fuels. Undertaking the task of remineralization is urgent to restore our agricultural soils and to save the dying forests in the temperate latitudes and stabilize our climate.

On the Cover: *Gary Harding with a healthy bunch of remineralized bananas from the Harding Plantation in Australia. The bananas were remineralized with MinPlus, a volcanic rock dust developed by Sam Catalano of Pacific Mineral Development. See story on page 28.*

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Remineralize the Earth

About and In This Issue

Editor Joanna Campe Christian Campe

It has been ten months since the last issue appeared and we did *not* meet our aim to get three issues a year to you. We decided to make this a double issue, with twice the material. Unlike past double issues we find it necessary to count this as two issues on your subscription to meet the extra printing and mailing costs. We thank you for supporting our efforts to get all the news we can out to you.

One reason for the delay of ***RE*** was the the creation of new research packets worthy of the high level of networking now taking place. We have confidence in this research for networking to all levels of government including the Clinton-Gore administration. Yes, we can *prove scientifically* that SR works!

We have reprinted articles that have appeared in two highly recommended publications, *In Good Tilth* from Oregon and *Annals of Earth* from Cape Cod, Massachusetts.

We have practical hands-on articles, and news from all over the world of current projects and happenings to inspire your own projects and plans. We'd like to encourage networking with other remineralizers and keeping us up to date with your activities, large and small. We love to receive photos; black and white are best.

You'll notice in this issue a step up in recognition of remineralization both in the U.S. and worldwide. Our efforts are making a difference!

A new campaign is being mounted to remineralize the Cascade Mountains in Oregon. If you live in the region, consider joining and supporting this initiative.

Please support EarthDance and their continued renewal of Grandfather Mountain and the surrounding forests in their region, and the inspiring television documentary they are producing.

Lend your support also to the Dellums bill H.R.H. 970 in Congress which calls for remineralization as a part of a climate stabilization program and the Earth Regeneration Society which initiated it.

The next project of ***RE*** is to put together in one volume the best articles that appeared in the newsletter version before ***RE*** and it will be called ***The Best of Soil Remineralization: A Network Newsletter, 1986-1990***. Almost all past issues are out of print and we have been receiving requests for them. This will make the articles more accessible and economical. We hope to have those available in June. After that, because the first two issues of ***RE*** are already out of print we'll begin a volume called ***The Best of Remineralize the Earth*** so that new subscribers can continue to inform themselves as much as possible.

And an ongoing thank you to Janet Scott, Willow LaMonte, Don Weaver and Mark West, without whom, this issue wouldn't even be *close* to possible, with a special thank you to Davina Colvin who transcribes of our interviews. This is the *we* of ***RE.***

Articles are contributed, and the work done on the magazine is volunteered except for a stipend to reward those who have given heroically of their time and efforts.

That is all about *us* and we hope to hear more about *you.* We enjoy the wonderful letters we receive and are grateful for your support over the years. Petra Kelly was a reader and supporter of SR.

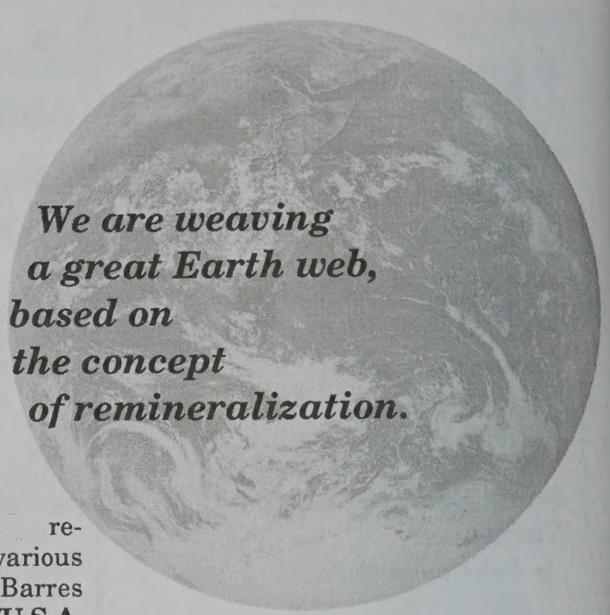
In Memoriam

Petra Kelly
1947-1992

Co-founder of the Greens
Member of
German Parliament
and a great inspiration
to so many

THE SR COMMUNITY
WHO ARE WE?

by Joanna Campe



We are weaving a great Earth web, based on the concept of remineralization.

The magazine is a forum for the remineralization community – a very diverse community made up of ecologically concerned and active individuals and groups, gardeners, farmers and foresters; those concerned with nutrition and health, scientists from different fields such as agriculture, geology and climatology and policy makers on the city, state, and national levels.

There are readers who wish to create small-scale sustainable, local and regional businesses, the larger companies and the National Aggregate Association. There are those concerned with treating sewage sludge and wastewater treatment with rock dust.

Within this readership are people committed to macrobiotics, natural hygiene, and simply vegetarian and natural foods, those interested in homeopathy and naturopathy who are remineralizing because they realize that soils are mineral deficient and foods are not supplying the minerals needed for optimal health. There are biodynamic farmers and gardeners, and those dedicated to permaculture and many other forms of organic agriculture.

There are many readers in the Peace Corp and organizations outside the U.S. on all continents and in such widespread countries as El Salvador, Cambodia, Nepal, the Phillipines and Finland.

In Sweden, green activists have been working to get remineralization on the platform in Parliament and Dr. Michel Pimbert of **ICRISAT** is doing SR research in India. **Men of the Trees** in Australia is doing large scale remineralization trials for various species of trees. Dr. Herster Barres of **Macadamia Costa Rica/U.S.A.** is doing remineralization trials on a large model macadamia tree farm in Costa Rica.

Bill Holmberg of the **American Biofuels Association** in Washington, D.C., an enthusiastic advocate of SR and one of the organizers of the **Environmental Inaugural Ball,** called Bob Cannard, who sends his SR veggies to the famous French restaurant **Chez Panisse** in San Francisco, and requested his vegetables star on the menu of a dinner given on a cruise ship as a part of that Inaugural Ball.

The National Aggregate Association now has a Task Force on Remineralization, exploring its potential for their industry.

The **Earth Regeneration Society** has put out a volume, *Whose World to Lose? Ours,* which details their solution for the climate crisis, including a program for massive remineralization on a foundation of full employment.

In North Carolina, the **EarthDance Institute** and local students are remineralizing trees dying from acid rain near Asheville and plant pathologist Dr. Robert Bruck and graduate students from North Carolina State University are monitoring the results. Increased height growth and health of the trees is impressive so far. Danny Miller of **Ironwood Productions** is putting together a documentary for PBS, *The Other Side*, which will include the EarthDance remineralization initiative.

Helene Huber is promoting biointensive gardening in community and church gardens and advocates SR through her newsletter ***Gardeners in* Community.** And Sister Miriam McGillis and the community at **Genesis Farm** in New Jersey are doing SR trials.

We are weaving a great Earth web, based on the concept of remineralization.

We are beginning to get national attention, the result of our collective networking! The May-June, 1992 30th Anniversary issue of ***Organic Gardening*** (1,000,000 readers) did a large feature on SR, mentioning our magazine.

Newsweek magazine (Nov. 23, 1992) had a cover story called “Doomsday Science” that included the article, “Return of the Glaciers.” It pointed out that recent research in climate on the role of precipitation in ice sheet growth may very well prove John Hamaker to be correct, that global warming may be taking us into the transition to the next Ice Age. The article sums up by quoting Hamaker advocating SR of forests worldwide to stabilize the climate.

New articles out soon: ***Outside*** magazine will feature SR including **EarthDance** in their May issue. About the same time, the *Wall St. Journal* magazine ***Smart Money*** will also dedicate an article to SR.

Remineralize the Earth is dedicated to promoting SR as advocated by Hamaker and Weaver in *The Survival of Civilization.* At the same time it is dedicated to reporting on the activities of those committed to remineralization and who are exploring it within the context of the their own work and activities.

The SR community is still a small one, and ***RE*** wishes to be inclusive in its support of those exploring remineralization. The challenge lies in representing the concerns of a diverse community. The magazine does not necessarily advocate or agree with everything that is printed but wishes to fairly represent and reflect its readers.

This magazine is primarily about adding mineral nutrients. Hamaker ideally favors, the use of glacial moraine as advocated at the beginning of each issue of ***RE*** in the article *"The Rock Dust Primer."* He also advocates remineralization by other means when glacial moraine is not available, from river and seashore gravels to local sources of gravel and single rock types (if some advantage can be derived and nothing else is close enough or affordable), to mixtures of rock types, and sea solids. There are various products which have proven themselves successful and get good results. See the *Gravel Sources* section.

Some readers might ask, what do health supplements like Super Blue Green Algae have to do with SR? Eating the algae is a way of making up for the mineral deficit in our foods. Until it becomes the norm to eat foods complete with minerals and trace elements, we will be concerned with the various ways to supplement our diets with highly assimilable mineral nutrients.

Let us get on with the task of getting minerals into our soils, forests, foods and bodies in the best ways we know how.

Just a paradigm shift away from conventional NPK farming is remineralization, a vast new frontier, part of the sustainable agriculture of tomorrow.

Campaign to Remineralize the Cascade Mountains in Oregon

The Timber Conference in Oregon recently took place with the attendance of President Clinton and Vice President Gore. Remineralizers there have a campaign to remineralize the eastern side of the Cascade Mountains. The forests are dying and the timber industry would like to go ahead and cut them down, or "salvage" them, because "they are dying anyway."

Remineralization would regenerate the forests and create new jobs in forestry at the same time that old growth forests are preserved.

The new administration, the state of Oregon, the Forest Service, and the timber industry and environmentalists would all have a common cause in remineralization.

A study released in Germany in 1986 showed *four times the timber volume* after 24 years in a forest where pine seedlings were planted versus the controls. One application of basalt rock dust lasted 60 years. (Sauter and Foerst, ***RE*** Forestry Packet, p. 24.)

Oregon resident and rock dust distributor Roger Kahane says there are enormous resources of basalt rock dust locally available in the Cascade Mountain bioregion.

If you wish to join with Roger Kahane, Mark Tripp and others in support of a campaign to remineralize the Cascade Mountains, please contact:

Roger and Gayle Kahane, 7260 London Rd., Cottage Grove, OR 97424, (503) 942-DUST.

Recovery wishes to *RE* contributor David Yarrow

On August 6, 1992, writer and regular ***RE*** contributor David Yarrow was visiting a friend who was moving to Wisconsin. They were helping some friends move a house down the road. He could see that the chimney was going to intersect a high tension power line that was going across the road. He got on the roof with a stick to lift the line over it thinking it was insulated. It was not. When he touched the line with the stick, 8000 volts came down the line and he was very badly burned and electrocuted, landing midair in the front yard of a house.

David landed on his back injuring his spine. That was where his bad luck ended and good luck began because the homeowners were both paramedics. The wife went to the phone while the husband gave CPR.

David had massive burns internally and externally. Major skin grafting was necessary. Rods were surgically put in his back to stabilize the spine.

He has been at the University of Wisconsin hospital since August undergoing many operations and therapy. He moved recently to a private home where he can receive more intensive caretaking. He is experiencing tremendous pain day to day as a result of the regeneration of the nerves.

David's contributions as a writer-activist are great: at the Earthwise Education Center in upstate New York he was helping to resettle homeless individuals by teaching them organic farming and self sufficiency. He has written extensively on the environment, macrobiotics and Native American issues and worked to create organic certification in New York. Through his contact with Robert Able of Gernatt Gravel, an initiative began leading to the Task Force on Remineralization within the NAA.

Being macrobiotic David would appreciate any food being sent to him that is organic and of high quality to assist his healing, especially seaweeds, grains, beans and blue-green algae. I would like to suggest it be done mail order through the Gold Mine Natural Food Co. Call 1-800-647-2929. They will be in touch with David. To send fresh organic vegetables/fruit call Diamond Organics 1-800-922-2396. He would also appreciate ecological/alternative magazines/publications. He can be contacted at: 1329 Dewey Ct., Madison WI 53703. (608) 257-5973.

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A BRIEF PERSPECTIVE
On Soil Remineralization and the Climate

Soil Remineralization

The soils of the entire world have become severely demineralized by erosion over thousands of years. Plants require a continuous intake of minerals, just as we do, and for very similar reasons – calcium to build structural support, iron to carry oxygen, and so on. Plants growing on mineral-depleted soil do not get enough nourishment and so become smaller, less-abundant and less hardy, more vulnerable to the insects, worms and fungi they are prey to.

Remineralization causes a phenomenal growth of the microorganisms in the soil. It increases the nutrient intake of plants. It counters the effects of soil acidity, prevents soil erosion (just for that reason it would be worth applying rock dust), increases the storage capacity of the soil, contributes to the building of precious humus complexes, has anti-fungal properties, and when you spray it on plants it repels insects as well. The plants and trees become highly resistant to insects, disease, frosts, and drought. Remineralization also enhances and speeds up the process of composting, so if you're composting for your garden, consider putting on some rock dust. It can be even more effective than just directly applying it to the land.

For Forests

The results of long term experiments released in 1986 showed that *in a forest where pine seedlings were remineralized, after 24 years the wood volume was four times higher* than in the untreated area.

For Agriculture

The best source of soil minerals is simple crushed gravel dust. In 1976 John Hamaker spread gravel crusher screenings on part of his ten acres in Michigan. The following year, in an area of sparse rainfall and dry summers, *and with no irrigation,* his corn produced 65 bushels per acre, compared to yields of under 25 from other local farms.

Moreover, when independent analyses were done, Hamaker's corn was found to contain 28% more protein, 47% more calcium, 57% more phosphorous, 60% more magnesium and 90% more potassium than the same type of corn grown with chemical fertilizers nearby.

Twenty years ago the USDA published studies which showed that cement kiln dust (a less-satisfactory source of minerals) also produced better crops, but they couldn't understand "what element" in the dust was responsible and dropped the matter.

Don Weaver grew 18-foot pole beans on remineralized soil (Jack and the Beanstalk?) and got *two to four times the normal organically grown yield.* Alan LePage of Vermont grew a crop of carrots averaging 1-1/2 feet long. And there was no insect damage to any of these crops.

Hamaker estimates that on fully remineralized soil, American agriculture could grow *four times* as much food as it is capable of now – or the same amount of food at about one-fourth the cost – and with no pesticides or chemical fertilizers.

The Nutritional Aspect

When we eat food grown on depleted soil we too, like the plants, lose our natural resistance to disease. All the degenerative diseases have been on the rise in America in recent decades. Dietary fat, cholesterol, salt and overly-refined foods seem to be major factors, but a serious deficiency of minerals in our food may be another. Mineral depletion of soils has been found to be directly correlated with death rates. And deficiencies of only one of a number of trace minerals-- copper, iron, selenium, etc. -- have been found in laboratory studies to be associated with an increased risk of cancer. You may want to grow more complete, nourishing food for yourself and your family.

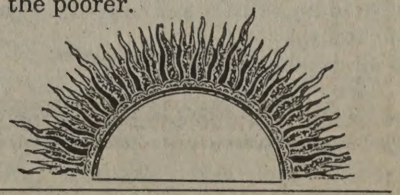
A Global Perspective On Climate

The problem of soil demineralization also has a global perspective. It is known that the Earth's soil becomes demineralized during each interglacial period, the relatively short 10,000- year warm period between each 90,000-year major Ice Age. Consequent decline and death of the world's forests and other vegetation which occurs causes great quantities of carbon dioxide to be given off. The level of carbon dioxide in the Earth's atmosphere has been rising exponentially for the past century. Carbon dioxide and other greenhouse gases trap excess heat from the sun, potentially affecting the world's climate.

It is also well-known that when the glaciers advance and then recede during each recurrent Ice Age, they grind down rocks in their path, and that their mineral-rich dust is blown far and wide over the surface of Earth, remineralizing its soil and causing plant life to thrive again.

John Hamaker has supplied one missing piece of a cosmic puzzle to provide an explanation, long sought, of the awesome 100,000-year cycle of major Ice Ages. Hamaker points out that the greenhouse effect occurs primarily in the tropics, which get the most sun, rather than in the polar regions which get very little. When this happens, the temperature differential between the tropics and the poles increases, resulting in fierce wind systems, hurricanes, tornadoes and storms.

The moisture picked up by these increasing storm systems also is transported to the higher latitudes, where it gets deposited as snow and ice, eventually bringing on glaciation and the next Ice Age. This has been happening in recent years, with record snow cover in the Northern Hemisphere and a shortening of the growing season, by weeks in some places, a pattern which is also accelerating year by year. Hamaker estimates that within a few decades the growing season may have decreased so much that millions of people will starve, in the richer nations as well as the poorer.



The above information is condensed from the writings of John Hamaker, Don Weaver, Larry Ephron and Joanna Campe.

A Rock Dust Primer

◆ **Hamaker quotes and gems**

Approximate Application Rate Conversions

3 tons per acre = 14 lb. per 100 sq. ft. = 1.25 lb. per sq. yd.
10 tons per acre = 46 lb. per 100 sq. ft. = 4 lb. per sq. yd.
20 tons per acre = 92 lb. per sq. ft. = 8 lb. per sq. yd.

What Type of Rock Is Best?

Feeding poor soil with mixed rock dust may be compared to feeding an ill person a varied diet of unrefined, natural food. If no one single food is a panacea, it might follow that no single rock type is "ideal". Indeed, the virtue of glacial gravel is said to lie in its broad spectrum of rock types. Hamaker advocates the use of glacial gravel dust, ideally followed by river and seashore gravels and mixtures of single rock types.

John Hamaker in the book *The Survival of Civilization* suggests finely ground glacial gravel because that is nature's way throughout millennia to create fertile soils. Glacial gravel, which is a natural mixture of rocks, will create a broad spectrum of minerals in the soil in a natural balance.

Much of value can be gleaned from Europe and the research and experiences there (where single rock types and combinations of single rock types are used.) Hamaker's approach, however, may very well offer an even greater potential for an ecologically sustainable and sound agriculture and forestry.

Does It Need To Be a Special Kind of Gravel?

Again, the analogy of feeding soils to feeding humans is pertinent. From simplistic notions of human dietary requirements as straight protein-fat-carbohydrate ratios, our understanding of specific human dietary needs has grown to staggering sophistication and complexity, and we are now learning that what we don't know may exceed what we do. Similarly, we have come a long way from the simple NPK idea. But no amount of controlled research has conclusively told us (or likely will ever tell us) precisely which minerals specific plants really need and in what precise proportion. The attempt to second-guess nature in all her complexity is sure to be a futile and perpetual game of catchup.

Hamaker asserts that:

"Microorganisms select what they need to make the compounds of life, and reject to the subsoil what is not needed, [such as] aluminum, silicon, iron, etc., which are generally in excess [in gravel dust]," further pointing to "the Kervran research on biological transmutations", which suggests that biological organisms may play an active role not only in selecting specific elements, but also in modulating their elemental nature to create needed materials where they are in short supply. Hamaker says:

> *As long as the soil is neutral [in pH] or close to it, microorganisms will control what goes into the plant roots. These controls are off when the soil is acid or acidic chemicals are added.*

Composting With Rock Dust

Combining gravel dust with organic materials in compost is a great way to solve application problems and speed up the process. Don't forget a handful of soil to innoculate with organisms. Gravel dust improves aeration and structure and therefore prevents rotting. Gravel dust is assimilated even more quickly in compost than in poor soils.

Compost and gravel dust are a symbiotic combination: the compost provides an excellent medium for the "microorganism population explosion" promoted by the dust, and the gravel dust will not only help create more organic matter, but will also help hold it in place, reduce odors and conserve it.

Add 2-20 lb. of rock dust per cubic yard of compost, if one is doing pile or windrow composting.

Soil Acidity

Soil pH should be measured annually. If the soil is acidic, agricultural limestone may be added together with the rock dust to bring the soil pH to neutral. Gravel dust will also neutralize soils to a great degree, but limestone is a quick remedy for agricultural soils. Limestone is not recommended for forests as it will destroy the humus-building complex over the long term.

Keep Insects In Natural Balance In Your Garden

For short-term rescue, very fine dust sprayed directly on plants and trees has been shown in research in Germany to deter insect infestations very effectively. Trails of rock dust around the garden help keep slugs out. And healthy remineralized plants will not be plagued by insect infestations in the long term.

How To Apply Gravel Dust

There are many ways to apply dust to the soil; which method you use depends on the scale and your preference. It can be spread by hand out of a wheelbarrow, or roto-tilled and disked in. Farmer John Sundquist applies it with a manure spreader, bander or an "E-Z Flow"-type fertilizer applicator. He also uses rock dust in a potting soil made of compost, ashes and peat moss.

How Much To Use

◆ *A grower of crops or a gardener needs a good response the first year after a fall application. The response in any one year depends on the amount of minerals available to the microorganisms, soil moisture and the amount of inert organic matter.*

◆ *If the last two factors are satisfactory, as little as 3 tons of gravel dust per acre worked into the top 4 inches of soil should give good results. However, I prefer about 10 tons per acre worked in about 8 inches, since one application will eliminate the cost of a number of more frequent applications and give high yields.*

The Application Conversion chart above will help you to determine how much gravel dust to use: 3 tons per acre is considered the minimum application, 10 tons per acre is Hamaker's preferred long-term application, and 20 tons per acre is given as a major remedial application, for especially dry, poor soil. Smaller amounts are recommended if the rock dust is finer than 200 mesh.

Finding Local Gravel Dust

To find Gravel grinding operations in your area, call your local gravel pit (look in the *Yellow Pages* under Cement-Wholesale, or Sand and Gravel) and ask if they have crushed

Particle Size Conversion

Particle	Diameter (microns)	"Mesh"
Fine sand	250 – 100	50 – 125
Very fine sand	100 – 50	125 – 250
Silt	50 – 2	250 – 6000
Clay	2 or less	6000 or more

gravel screenings made from mixed rocks, the kind that comes out of river beds – crushed and passed through a 1/4 inch or finer screen. The gravel dust will probably cost from $1– $8.00 per ton plus the cost of transportation if the gravel pit delivers it to your garden. As most of the cost is in transporting the rock dust, having a truck or access to one is an advantage. A cooperative initiative with friends and neighbors would also cut costs down.

The Particle Conversion Chart shows various categories of "soil separates" (ground particles) listed with their diameters in microns (thousandths of a mm.) and their corresponding screen mesh sizes. "Mesh" simply refers to a screen with a given number of holes per inch.

The more finely ground the rock, the more readily microorganisms will have access to the minerals. John Hamaker uses the term "gravel dust" to mean a dust "90% of which will pass through a 200-mesh screen".

Testing Your Gravel Dust

◆ *Several people have reported to me that gravel dust does not work or it will have [only] a temporary effect. The don't describe the dust in detail, but I suspect they had very little dust in what they call 'dust'. Know what you are buying or you may be badly disappointed."*

Here are three simple, quick tests you can perform at home:

Pot Test: A pot test will give you immediate, practical proof of what the product will do in the soil. It is a good idea to add the gravel dust to clay pots and plant radishes or other fast growing plants and observe their progress. As John Hamaker writes,

◆ *Doing a pot test is the most convincing argument I know of. Anybody can do it. There are testing laboratory grinders everywhere. There is no lag time. In 6 hours you can get a microorganism population explosion. Taking some 6" clay pots, I filled them with a 50-50 mixture of earth and peat and 3 heaped tablespoons of dust. The results were astonishing!*

You can compare different mixtures or samples of gravel dust depending on what's available in your area. Use a control without rock dust to compare as well. You can also begin with small plots in the garden. You can see the results of the gravel dust you've chosen and then add it in larger quantities to your garden. Work the gravel dust into the topsoil, if possible.

Separate Layer Test: Purchasing a product based on its stated screen mesh alone still leaves room for error. A purchase of 90% or even 100% 200-mesh screenings could contain only sand and silt, and no true dust. A separate layer test will tell you approximately how much of your "dust" is really dust and will be suspended in water.

Fill a clear glass half full with your sample and cover it with about two inches of water. Shake it up vigorously, then allow it to settle overnight. The dust, silt and sand will settle into three distinct layers with the dust at the top.

If the container is allowed to stand until the water has dried out, the dust [topmost] layer will shrink to about 1/3 the original measurement and give a more accurate percentage of the dust. Your first observation, however, will tell you if you are buying mostly sand. The coarser the grind, the less effective it will be in the soil, and the more you will need to use per acre.

Moisture Test:

◆ *If the material is bought by the yard, there is a probable increase in bulk when wet...The buyer needs to test so one can know the actual weight of dust one is applying to the land.*

Take a sample, weigh it, then dry it thoroughly in the oven [and re-weigh it]. This will tell you how much of the weight you are buying is moisture.

Chemical Analysis

In most situations, having a formal chemical analysis made is probably going to unnecessary trouble. A pot test and small-scale trials with fast-growing plants will give you more accurate information and with less expense. In cases where you have doubt about its source, you may wish to have a gravel dust analyzed to ensure that it is free of radioactive elements and toxic industrial by-products. In most cases your source will have already had to undergo such testing in order to get a license to operate. This is worth some homework. If you are not able to obtain documentation to your satisfaction, it might be wise to go ahead and obtain your own independent lab tests. A good testing lab is listed in the *Gravel Sources* section on page 67.

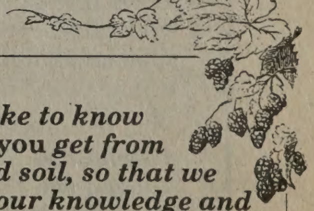
More Tips From Hamaker

◆ *One other thing might be useful. I put about 2 inches of sand on our garden before plowing. It will last a long time and give some yield after the dust is used up. I am sure it has been contributing to what we grow. Unscreened sand (preferably fine sand) from a local gravel pit is much more economical than shipping dust which is mostly silt and fine sand.*

◆ *Sometimes the gravel pits have mesh screens and can measure the exact fineness of the gravel. Though it may be hard to find the ideal fineness – 90% passing through a 200-mesh screen – it may be practical to use even if only 20% or so passes through a 200-mesh screen and at least 50% passes through a 100-mesh screen. You will have the finer material immediately available to the soil and the rest will break down over time. If most of it passes through a 200 mesh screen, it will have a fine consistency like flour or cement. The gravel pit may have machinery to crush the rock finer and may crush it for you.*

Soil erosion is an effect of the shortage of minerals available to support the soil organisms. As Hamaker says,

◆ *That shortage can be made up on any piece of land in the time it takes to work ground gravel dust into the topsoil. When that is done, the soil microorganisms begin to multiply and it is they who prevent soil erosion by granulating the soil and holding it against both wind and rain.*



We would like to know what results you get from remineralized soil, so that we can improve our knowledge and data-base. Please call or write us. Photos with written reports are welcome and an important contribution to our network. Thank You!

What in the World Is Glacial Dust?

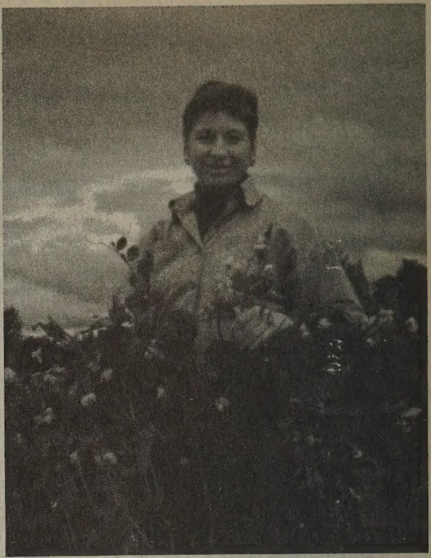
by Yvonne Marie Rado

The use of ground rock by organic gardeners/farmers for remineralizing their soils has spawned a mini-vocabulary of its own. Most often, the terms "glacial" and "rock" dust have been indiscriminately interchanged, when in fact, there is a significant difference between the types of material. Glacial dust is a fine form of *glacial moraine*, which is a conglomeration of varying sizes and types of rocks. The varied types of rock can be from all three major rock groups: igneous, metamorphic and sedimentary, and encompass many mineral types.

Glacial dust is formed by huge *moving* glaciers that are miles thick. Their combined pressure and movement collect and grind the myriad types of rock in their journey of hundreds of miles. Hence, the broad spectrum of elements is accomplished in one grand natural mix. (Stationary glaciers formed by layers of sequential unmelted snow packs cannot offer the broad-spectrum material of the moving glaciers.)

Using genuine glacial dust is Nature's way of remineralizing the Earth. Among the many benefits of using glacial for the organic gardener/farmer are: 1) broad spectrum of elements from the grand mixture of rocks collected by glacial action, and 2) no contamination with by-products of machine grinding. (Conventional machinery set to minus 200-mesh material is so "close to itself" that it grinds some of its own grinding surface into the mix over time. Naturally ground glacial avoids possible higher amounts of chromium, nickel or lead from conventional machine grinding and also possible contamination from lubricating oils in use.

As one can see, glacial dust is a unique and specific material not to be confused with material of other origins.



But what are people to do who want to remineralize with a first-rate material, but don't live near a glacier and are unwilling to pay shipping costs for genuine glacial? John Hamaker says in the landmark Hamaker/Weaver book, *The Survival of Civilization*, "if the principal elements are there in *roughly the same quantities as in glacial gravel* (emphasis mine), and if other elements are present, the gravel will be useful."

Following are the percentages of principal elements of representative glacials. Group 1 samples were taken from the beds of rivers which carried glacial meltwater; Group 2 samples were taken from glacial moraine deposits.

% OF PRINCIPAL ELEMENTS IN GLACIAL DUST FROM REPRESENTATIVE SAMPLES

	Ca	Mg	K	P	Fe
Group 1					
Glacial #13	1.86	0.08	1.83	.014	1.89
Glacial #14	2.18	0.98	3.38	.011	1.92
Glacial #17	1.62	0.36	3.68	.009	1.26
Glacial #25h	4.19	1.91	0.90	.020	3.25
Group 2					
Glacial #36	3.20	1.49	1.22	.060	4.59
Glacial #46	2.77	1.35	1.25	.050	3.84
Glacial GBBG	2.58	1.19	1.02	.054	5.60
Glacial T-1	3.20	1.70	1.40	.075	3.60

These dusts are included to illustrate the general character of a glacial: a mixture of subtle amounts of a broad spectrum of elements with no large amounts of any one or group of elements. Complete analysis of each of the above samples confirms their broad spectrum.

Though Hamaker favors glacial dust as the optimum material, he also recommends the use of suitable local material in the absence of glacial. River rock dust is a good second choice to glacial, the best being found far enough from head waters to allow some distance for collecting differing parent rock, but not so far down as to enter farm/urban pollution zones. Another way of accomplishing the most important benefits of a grand mixture of elements is to obtain several dusts from different locales which individually would constitute a narrow spectrum mineral. Applying that combination of material to one's soil can also be of benefit.

Your soil will improve with whatever remineralization effort you make. As a consumer, it is only wise to know the exact character of the material you purchase. All glacials are rock dust, but not all rock dusts are glacials.

For information on use and application of glacial dust for soil remineralization, write to:

Rado Rock
P.O. Box 278
McKenna, WA 98558

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Yvonne Marie Rado with peas remineralized with Rado Rock. Yvonne says, "Remineralized peas are so sturdy, they have grown 'this high' without support. They were just starting to lean over from their own weight. I'm about 5' 2" and the tallest stalks reached my collarbone! No insect damage...no tending. I choose the crop and leave the rest to the microorganisms...other than watering during intense heat." (See photo on previous page)

ROCK DUST: *THE "HOT" NEW FERTILIZER THAT MAKES PLANTS GROW*

by John Sundquist of Rivers Turn Farm

Remineralization on my farm shows exciting and dramatic results. I'm not too familiar with the theory of remineralization, but for the last three years I've been applying finely crushed gravel (1/8" minus slurry grade from Egge's Sand and Gravel; cost, about $9 per ton delivered) to my beds to see what would happen.

The treated ground has produced, without much regular organic fertilizer, crops that are high-yielding, vigorous, healthy, and with a tremendous shelf life and flavor.

What seems really remarkable about the plants, however, is their insect resistance. Three years ago the brassicas planted in the treated ground had much less root maggot damage than usual. Crops in 1989 showed similar good results, and 1990 was really impressive. Flea beetle damage to turnips and Chinese cabbage seedlings was virtually nonexistent, and root maggot damage was minimal.

Potatoes and bush beans planted together in the same remineralized beds absolutely glowed with health and they showed no insect damage on their leaves. Our neighboring farmers (all non-organic) said 1990 was a bad year for corn earworm and that the spider mites in their corn were the worst they'd ever seen. We had no spider mites and found only three worms in a half-acre patch of Golden Jubilee!

I've been putting on 4 to 7 tons per acre as a powder applied to the surface of raised beds, then rototilling or discing the rock powder in. It can be applied with a manure spreader, bander or an "E-Z Flow"-type fertilizer applicator. I'm also using rock dust in a potting soil made of compost, ashes and peat moss. In 1991 we are going to do more research, including measured amounts, controls and replications, and, hopefully, nutritional analysis.

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ROCK DUST AND MICROBIAL ACTION IN SOIL:

The Symbiotic Relationship Between Composting and Mineral Additives

by George Leidig

***RE** has always emphasized the importance of recycling organic matter along with soil remineralization but for lack of space has left the topic to the numerous organic gardening magazines out there.*

On a trip to Austria six years ago I visited with the Luebkes at their farm. They specialize in a "gourmet" composting technique that incorporates rock dust. They have developed an extraordinary fine-tuned technique for building humus in soils that can be easily applied, measured, and maintained by a farmer or gardener.

The Luebkes are now able to create soils with as much as 18% organic matter! Those industrially-farmed soils in the midwest have as little as less than 1% organic matter. In California industrial farmers are likely to say 2% organic matter is "impossible to achieve".

Composting is a very practical way to apply rock dust to soils. This particular method is for those who wish to go as far as they possibly can in creating fertile soils. J.C.

For many European farmers, gardeners, and nurserymen, it just makes common sense to be adding back to the soil the wide spectrum of trace minerals that have been depleted over the years. I have spent some time living in Europe, where rock powders have been tested and used quite extensively for years, observing their effectiveness and practical application.

Farmer aerating compost with a Sandberger Compost Turner, which has a low-rotor RPM and provides gentle mixing and aeration of materials.

Talk to any well-versed soil scientist or knowledgeable farmer and they will tell you that humus is the basis of true soil fertility. To truly understand the nature of humus, one must take a holistic approach.

Over the last 150 years the focus has been on chemical reactions taking place in the soil, which surely is one aspect of what goes on beneath our feet. But this is like looking at the trunk of an elephant and saying that is the whole beast. The total picture of soil fertility is chemical, biological, and physical in nature.

Producing humus is the ultimate example where these three things come together. But how is it produced? It is the microbes that orchestrate the whole process, therefore they must be placed at the center of the stage. Before people started to till the Earth, nature had no problem in maintaining sufficient humus and therefore correspondingly sufficient fertility levels.

George Leidig spent five years managing five-star restaurants. After leaving the culinary world, he spent several years working with the Luebkes who have created a revolution in composting. He now distributes equipment and supplies for the Luebke Composting Process as Autrussa Compost Consulting in Bluebell, Pennsylvania. This includes microbe-laced soil innoculant, tractor-pulled compost turners, and compact and affordable soil and compost testing equipment.

> ***...it is high time that American farmers take control again of their own destiny, and understanding the soil and its true basis of fertility is a first step.***

Guidelines for Rock Dust Application in Compost by the Luebke Method

- Finely ground rock dust should be added at a rate of 10-20 lbs per cubic yard of raw material.
- The particle size should be less than 20 microns in diameter, or pass through a #300-mesh screen or finer. The fineness of the material is important, since you want to assure that the minerals are readily available to the microbes during the composting process.
- Magnesium levels should be under 5%, since high magnesium levels rob nitrogen from the compost and soil.
- Calcium levels between 5-10% are preferred – calcium is a macro-nutrient essential for both microbial life and plant growth.
- The rock dust analysis should display a well-balanced array of micro-nutrients, which, as in the soil, stimulates microbial action. This is even more important in composting, since the microbes are totally limited to the materials present in the pile for their nutrition.
- Granite dust is not recommended for compost because of its quartz content. The large size and slickness of the quartz particles resist breakdown and inhibit the attachment of organic particles necessary for proper humus crumb formation.
- Rock dusts of volcanic origin are preferred, such as diabase or basalt, because of their high silica value. Silica is an often forgotten element, necessary for proper cell structure in plants and animals. Recent studies have shown silica to play a vital role in calcium and phosphorus assimilation.
- Rock powders that test with high paramagnetic values are thought to favorably affect both the composting process and plant growth. Although this is the topic of much current research, there have not been to date enough studies done to verify this scientifically.

But now that we have destroyed this delicate balance in most cases, the road back to the way it was is not such a simple one. Adding rock dust is one step. One still needs the organic materials, the microbes, and the correct physical environment for this transformation to humus to take place.

In reality it is very difficult for average farmers to accomplish this in their fields, because the process is much more complex than to just dump these raw materials onto your soil or compost pile and wait. Not only must all the ingredients be there: the organic matter, the clay fraction, minerals, and the microbes must be there also. Also, the ideal physical environment for humification needs to be provided. Proper moisture, temperatures, and oxygen are all needed. It is one thing providing this in theory, but quite another when it comes down to the actual problems and environmental stresses our soils face today.

I have had the opportunity over the past 7 years to to get to know, and learn extensively from Siegfried and Uta Luebke from Peuerbach, Austria. The Luebkes have spent over 20 years researching and applying sound ecological farming principles, and have developed a comprehensive system for humus building in the soil through well-orchestrated composting, green manuring, and rock dust application. They are considered the experts on composting and humus management throughout much of Europe, and their name is quickly gaining the same reputation here in the United States.

The Luebkes have followed the path into composting, because it is essentially a microcosm of what should be taking place on our soil. First there is a recycling of the organic fractions of carbon, nitrogen, and sulfur compounds. Next, there is an unlocking of tied-up inorganic minerals, through biological activity and chelation. Finally, all these nutrients are bound into the clay-humus complex, available only through the microbes at the time and amounts the plants need them.

We can then learn through composting about nature's laws, and progress on to apply her universal principles into our working of the soil.

In producing a truly humified, microbially-rich compost, adding rock powders is considered an integral part of the process. The trace minerals help support the population explosion of microbial workers necessary to produce a first-class product. The Luebkes have found out from their years of research and practical application that almost any mineral additive you would consider adding directly to

Many soils today suffer from one-sided activity; i.e., the soil has the ability only to perform certain tasks, but not others.

Ute Luebke teaching Austrian farmers hands-on composting techniques.

your soil, will benefit even more from the composting process. Another necessity is to add a clay source to your compost. Decomposed organic particles need something on which to attack, or else they remain unstable and true humus will not be produced. The Luebkes add clay loam or subsoil to their compost at the rate of 10% minimum by volume of the materials. Finally, the materials are inoculated with a mixture of 55 different beneficial bacteria, fungi, and *actinomycetes* which ensure the compost and subsequently the soil will possess the proper mix and amounts of micro flora.

When I talk about composting in this light, I am referring to much more than just piling materials into a heap and letting them rot for a year. Composting can be be defined as bringing the organic materials into a desired decomposition process, but a proper environment needs to be provided and maintained. Piles should not only contain the proper mix of materials, but also be well aerated, at proper moisture levels, and continuously monitored.

This is the aim of the Luebkes composting technique: all soil additives should either be composted first, or added directly only after the farmer is assured that the soils "digestive" system is in order. How can the average farmer or gardener find this out? The first step is to get out there with a shovel, and see if there is crop residue from the prior season. How long does it take for your soil to break down a cover crop and how long are nutrients tied up? Finding an "embalmed" corn stalk or other organic matter is definitely not a good sign; it signals your soil has lost its ability to recycle carbon, along with other nutrients. What is the depth of your "aerobic zone", the upper layer of topsoil in which these oxygen-loving bacteria and fungi can survive? For many, it is not much more that a few inches.

Obviously, the most direct method of testing would be to look at your soil under the microscope, which has been the basis of Siegfried Luebke's research. He looks at not only the total numbers of microbes, but the diversity of species in the soil and the specific functions that each of them performs. Many soils today suffer from one-sided activity; i.e., the soil has the ability only to perform certain tasks, but not others. Since the average farmer or soil consultant does not have access to microscopic inspection of samples, there have been simpler tests developed to evaluate this, such as filter chromatography and humus testing. In Austria, the Luebkes teach farmers these methods on a regular basis, so that they can go on to understand and take charge of restoring their soil. More recently they have taught a few classes here in the United States, which were more than well received. I'm sure that most of us are of the opinion that it is high time that American farmers take control again of their own destiny, and understanding the soil and its true basis of fertility is a first step.

In summary, I would suggest to anyone who really wants to learn how organic and inorganic nutrient cycling takes place in the soil, and how these are then made available in nature to the plants – learn how to compost properly. I emphasize properly because an unwanted decomposition process can do more harm than good, so either do it right or not at all would be my suggestion. Once you have accomplished this, you can then move on to understanding better and applying the knowledge that we all need to further human and our planet's ecological survival.

DOWN ON THE FARM

Top Produce Attracts Star Chefs

by Sibella Kraus

When Alice Waters, chef-owner of Chez Panisse in Berkeley, searched for an organic farm that could grow a wide range of fruits and vegetables, she asked Bob Cannard of Sonoma to be her primary produce supplier. The restaurant now buys most of its produce from Cannard's 25-acre farm. Menus are planned around the fruits and vegetables Cannard has available.

What makes Cannard's farm so special?

"There is a life and vitality and beauty to the produce because it is picked when it is completely mature," says Waters.

"The apricots are picked utterly ripe, the figs are big, rich and delicious, and the Satsuma mandarins taste wonderful," says pastry chef and Chez Panisse co-owner Lindsey Shere.

Cafe manager Catherine Brandel talks about the exceptional quality and variety of Cannard's greens. "We get dozens of salads, three kinds of radicchio, arugula, baby spinach, rapini, beet greens and roots," she says. Since Cannard's farm is a little more than an hour's drive from the restaurant, fruits and vegetables harvested in the early morning can be on the table by lunch.

Two years ago, Postrio, the instantly successful Wolfgang Puck restaurant in San Francisco, also started to buy produce from Cannard. "Cannard is our most accomplished grower," says executive chef David Gingrass.

On Saturday, May 4, Bob Cannard's farm, which grows more than 200 varieties of fruits and vegetables, will be open to the public for a farm field day.

Cannard says "weeds and rocks" are what make his produce so good.

Waist-high grasses and wild mustards make his peach orchard look almost abandoned.

Importance of Weeds

"These weeds have almost achieved reproductive contentment," Cannard says, striking the full seed heads on the silky wild grass. "As soon as they make seed, they will die, lie down and provide mulch that keeps the roots of the trees cool."

"The weed roots hold the soil (and keep it) from eroding, and the decomposing weeds provide steady nutrition to the microbial life of the soil over the course of a year. These microbes, in turn, help to feed the roots of the trees," says Cannard, a part-time horticulture teacher at Santa Rosa Junior College.

The emphasis is on feeding the microbial life of the soil rather than feeding the crop.

Cannard's peach varieties include Indian Blood, Elberta, Suncrest and other early and late varieties requested by Chez Panisse to extend the peach season.

For Cannard himself, cultivation and environment are more important than variety. Interspersed with the peaches and among the weeds are rows of raspberries, fraises du bois, red currants and asparagus.

Adjoining the peach orchard are several freshly plowed fields. The reddish soil is soft, fluffy and finely textured, though strewn with a few rocks. "This is not natively good soil," Cannard says. "It doesn't hold water well and there is not much topsoil, so I cannot abuse it."

In one of the fields, Cannard's four workers have just planted 25 varieties of tomatoes. The next field is planted with garlic, which is harvested as green garlic in spring and mature garlic in July.

A row of 30-foot-high cherry trees provides a border between the fields. Another nearby orchard is planted in the Blenheim variety of apricots so appreciated by Chez Panisse.

In addition to paying Cannard a fixed price for each box of produce, the restaurant owners also invest in capital improvements such as planting orchards.

A cool creek shaded by bays runs down the middle of the farm. Several of the far fields are still under their winter cover crops of grasses and mustards, intermixed with legumes that Cannard introduced.

These flowering meadows look so natural that it is hard to imagine they were ever cultivated, let alone scraped bare when they were part of a production turkey farm before Cannard's time.

Other fields have been freshly planted. Rows of little clusters of chive-like plants indicate the crop of baby leeks that will be harvested in early summer. Tiny seedlings with just a few bright green leaves are the spring spinach crop. In other rows, several different varieties of lettuce grow together in tight clusters, creating beautiful rosettes of bronze and green-hued leaves.

Little piles of finely crushed rock have been carefully placed around each plant of a new broccoli planting.

Rock Minerals

"I use rock minerals and crushed oyster shells to give plants mineral completeness and body," Cannard says. "I like small, tight, flavorful plants that keep their color and don't fall apart when cooked. Nitrogen is overrated and minerals are underrated, especially when you are going for flavor."

As part of what Waters calls "the symbiotic relationship between Cannard and Chez Panisse," the truck that delivers produce to the restaurant hauls kitchen garbage back to the farm to be composted.

The finished compost is used in the planting mix for the millions of plants that Cannard seeds annually. Some of these seedlings will be planted at Cannard's downtown Sonoma market garden at 400 West Spain Street, which has a small farmstand.

Other seedlings were recently transplanted to the fields by Chez Panisse cooks, waiters and busboys during the restaurant's annual spring planting party at the farm.

Reprinted with permission, © *San Francisco Chronicle,* April 29, 1991.

Solano County Vineyards Improved

by Bob Cannard

The four-acre vineyard had been heavily overcultivated and heavily degraded. The soil supported weeds about three inches tall that went to seed very early in the season.

We chiseled the ground, broke it up by mechanical compaction, ripped it up about 18 inches – and we planted cover crop on the ground and fed the whole vineyard, including the cover crop, by broadcasting application of about 500 pounds of crushed basaltic rock and 200 pounds of crushed oyster shell rock, which is a calcium resource. The rock was broadcast (spread) equally over the four acres, right on top of the soil maintenance crop as well as underneath the grapevines, using a small standard tractor spreader about six feet wide driven between the rows.

We did this for three years. In the first year the cover crop went up to about two feet, and in the third year it went up to about six feet, but it did not mature. It was not mowed or cultivated until the final crop was totally mature in June, at which point it was mowed. It was so thick and lush and vigorous.

The grapevines, which had problems predominantly associated with nutritional deficiencies, were manifesting a whole range of disorders, but mainly one that is labelled as *utypa.* The leaf surface was small, the fruit yield was low, the cane diameter was very small; there was heavy predominance of fruit rot (botrydis and mildews on the fruit), even with a fungicide spraying program.

I was there a couple of days ago, and the place is absolutely green and lush. There is no evidence of *utypa* decline in the vineyard. It has an excellent crop of firm, plumb berries – a really beautiful crop. It's a really stunning turnaround.

The vines are in rows, 6 x 10 foot spacing and are 12 years old. The ground was not very well pre-

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Bob Cannard is a farmer (see article on page 15) and consultant to vineyards in Solano County, California and teaches agriculture at Sonoma State College.

Some Crushed Rock Variables

Particle Size and Utilization Relationships

by Bob Cannard

Rock is found crushed to varying degrees of fineness, and it is all useful as an agricultural input. Coarser material, 1/8 inch by dust, is often locally available and inexpensive. Fine rock flour, with 100% that is 100-mesh, and 50% of which is 200-mesh, is currently a specialty product and has more preparation and transport costs.

Coarse rock is less expensive and less immediately available – characteristics which lend it to long-term use or perennial cropping systems and compost applications where high biological activity produces sufficient organic acids to actively digest larger rock particles.

Fine rock is more expensive as well as much more available. 100 pounds of flour has the surface area of 2000 pounds 1/8th by dust. Any time immediate plant response is required, as in annual cropping systems and sick plant application, rock flour has advantage. Another point is associated with spreading costs: less fine rock is used, but must be spread more often, matching costs with cropping.

In growing carrots, coarse material might be pre-plant applied and incorporated at two to three thousand pounds per acre. Fine rock might be effectively used at one to 200 pounds per acre with two to four applications per growing season.

If this carrot soil is rich in carbon and active soil life, similar results might be expected with either coarse or fine rock. However, if soil is low in life-support capacity, the finer rock side-dressed to the crop will aid current cropping systems more than coarse rock applications.

For raw mineral resources to be effective the relationship between its availability, the soil microflora, soil organic matter and sunlight energy held in organic bond must strike a balance.

Limits in any of these resource areas will limit the metabolism of the soil life system and that which grows from it, creating imbalances manifesting as low yield, pests, lodging, low protein, rots, poor color and flavor, low storage capacity, etc. The minerals contained in rock are as vitally important as air, sunlight and the digestive supportive process of soil life.

Rock content varies by source. The best sources are found as large gravel of 4 to 12 inches deposited from a wide range of original parent material. The flood plain of a large river draining many different mountains with their compositional variance is best. Sands high in the hardest element, pared when they were planted – on well cropped, heavily compacted soil. It was chiselled or ripped a little, but not very well to start with, and then they subsequently went into annual clean cultivation, year in and year out for the first five years, which caused it to collapse. The vines were going to die. (Clean cultivation means that no weeds are allowed to manifest and grow. They are killed as quickly as possible – as soon as the soil dries out enough to get a tractor in.)

The owners plant one crop a year of Chardonnay grapes, and they will continue to apply smaller quantities of rock dust annually. We began by adding 5-600 lb per year per acre and reduced it by 100 pounds per year per acre. We're now at about 200 pounds per acre, and I think we'll continue in the same fashion.

The object is to give the Earth many, many small meals – you don't want to overdose it by giving it too much all at once. If you place more raw crushed alkalis than the system can absorb, it won't do any good and can actually be deleterious. You want to use enough to feed the system, and giving it many light meals is more effective.

Reprinted from Whose World To Lose?, *the ERS publication. See article on p. 42.*

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silica, and clays, often leached of essentials, should be avoided. Large gravels still holding essentials, crushed to the desired degree of fineness, are ideal. Some sedimentary and soft tuff rock resources are ideal, but much more individual in content than mixed material as described above. Research is needed.

Application of crushed rock can be achieved with conventional tools regardless of fineness. In a small garden less than ten acres, or vineyard or orchard of 40 acres, hand spreading can be practical. In larger scale operations or where equipment is available, conventional side-dressers, easy flow gravity spreaders or broadcasters can be used. Some rock resources when moist have some hopper flow problems, correctible by mixing with low moisture compost, sawdust, etc.

I would recommend finding a gravel road with a ditch filled with leaf litter, and comparing worm size where rock fill joins organic matter in the moist gutter with worm size in surrounding terrain.

Or find a rose bush in summer with aphids, dusting the foliage and soil surface with rock flour. If this rose has full sun, often aphid population will experience marked reduction in one week.

Or select a field of wheat or alfalfa with low protein content and/or fungal problems. Dust foliage at 200 pounds per acre.

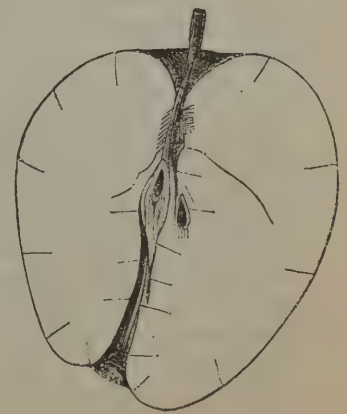
Or approach the old apple tree with a history of wormy fruit, dusting trunk and branches, broadcasting five pounds per trunk inch on soil, and if soil life is low, applying active compost on top of rock flour. During the first seasons of rock flour use, support the crop with occasional foliage dustings until soil systems increase sufficiently to once again support tree health.

Annuals respond quickly – wheat, alfalfa, vegetables in days, perennials – apples, grapes, pears – might require two years to once again get their act together.

If we recognize the importance of complete mineral nutrition, and accept the digestive process of natural acidulation occurring in the soil, moving the raw mineral nutrient from mineral to living organic bond, little would be risked by applying rock flour, and stimulating by all cultural practices an expanding soil life.

Costs of purchase and application vary, and should be balanced to advantage. Materials might run 20 to 100 dollars per acre with application costs in a similar range.

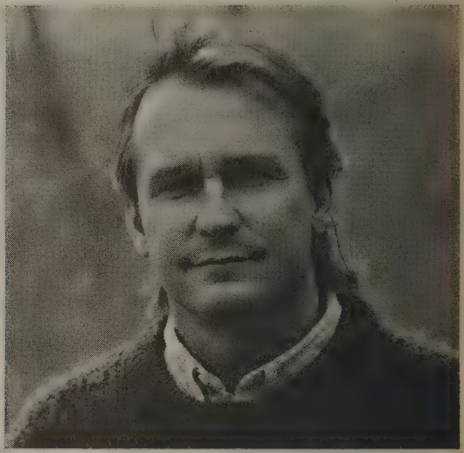
AIR
Carbon, water, oxygen, etc.
LIGHT
Full natural spectrum
SOIL LIFE
Fungal, bacterial, other
ROCK
Minerals: Ca, Fe, Zn, etc.
in balance =
GROWTH



EarthDance

AN UPDATE

by Mark Fields



"In wildness is the preservation of the Earth"

Henry David Thoreau

In June of 1992, EarthDance crews returned to Mt. Mitchell, North Carolina, joined by technicians from NC State University, and UNCA in order to expand research on the effects of remineralization on this severely affected forest area. During this 10 day period EarthDance members planted 5,000 fraser fir seedlings, and spread some 16,000 pounds of rock dust to selected test sites in the Mount Mitchell State Park. Mt. Mitchell is the highest peak in the eastern United States at an elevation of 6,684 feet.

Work began each day from early morning, as the teenage crew stretched their muscles and sharpened their shovels. Tired, bruised, sore and often sniffling from the previous days workout in the constant cold rain and wind, the young volunteers showed up with enthusiasm to get the job done. The minerals were packaged by U.S. Soil in 50-pound bags and were carried anywhere from 100 yards to a mile, or until they reached the test sites. The sites were mostly located in difficult areas to reach due to the thick underbrush and fallen rotting trees. Both adults and youth that participated in the project stated afterwards that it was beyond a doubt the most challenging physical work of their life.

Now, for the moment, all we can do is wait. Dr. Bruck and his team will return to Mt. Mitchell this spring to take tissue samples from the ailing trees and soil samples. We don't yet know how long it will take in order to see a response, we obviously hope it will be soon.

In western North Carolina we have some of the most spectacular natural beauty anywhere in the United States. It is an easy place to fall in love with. The mountains soar to the clouds in deep shades of blue and purple with rivers and waterfalls. It is a land of beauty and abundant life. As I arrived to this area in the summer of 1990 I did indeed fall in love, and decided to return here in the fall to begin EarthDance. I remember as I was driving east into the mountains for the first time, I noticed that the trees on the peaks seemed to be extremely thin, as if they were dying. As I asked around about this phenomena no one seemed to know very much, and even fewer seemed to care.

As I settled into the town of Asheville, I continued to search for answers about what I had seen on the mountain peaks, I was soon told that I should visit Mount Mitchell. When I arrived to this sacred place of the Cherokee people, I was shocked at what I saw.

It appears as though a fire has ripped through the mountain, leaving little life in its trail. Miles on end of dead and dying trees, many still standing with broken and fallen branches, slowly falling to the earth. Seeing and feeling the suffering of this mountain, is something impossible for me to describe. I just knew that something had to be done.

Over the past two years here I have learned that not only the forests of Mount Mitchell are dying in western North Carolina, but there are a number of varieties of trees that are dying or are being severely affected by something. Among these are the American Chestnut, the Dogwood, Fraser Fir, Red Spruce and the Oak (all varieties). Scientists say that they are dying due to a blight, or insect infestation, or disease, or ozone, or air pollution, but nothing concrete has been delivered that will prove the "root cause" and/or a potential solution to this crisis in our forests.

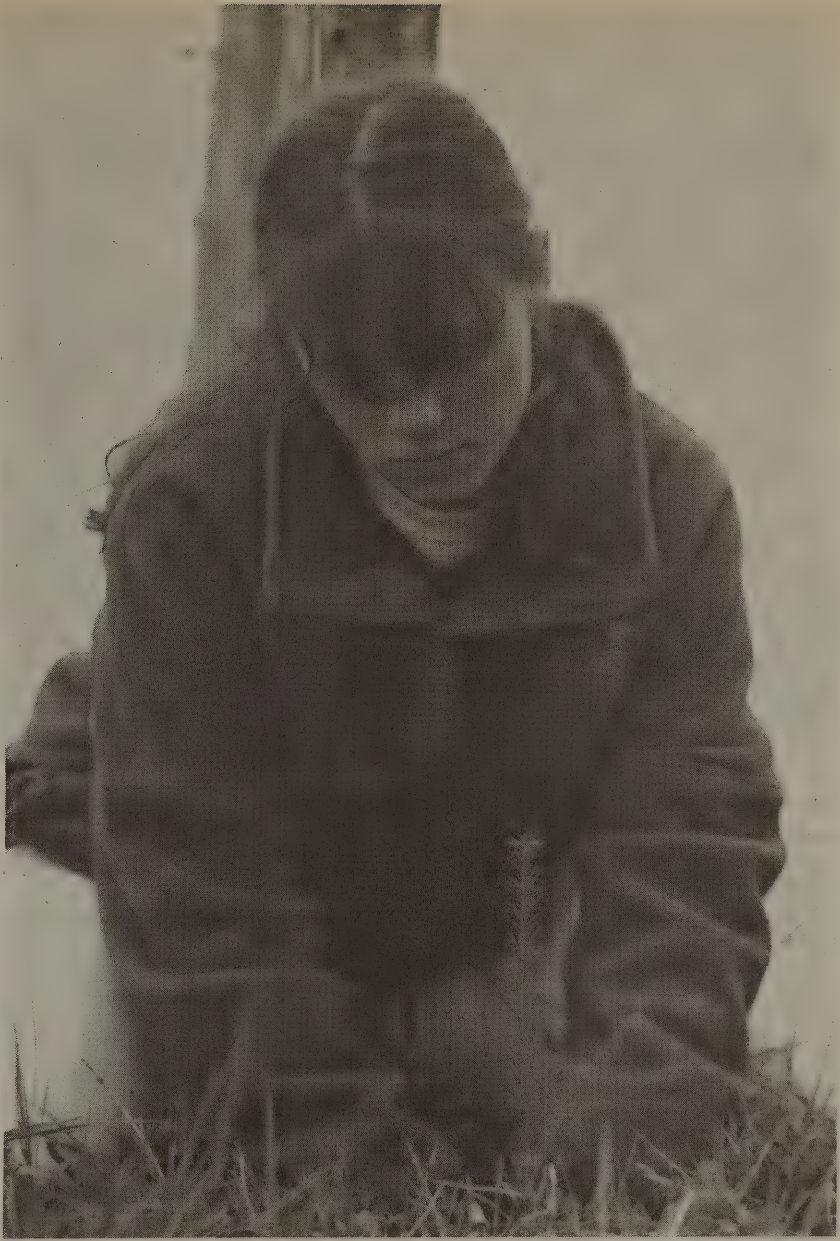
The Chestnut and the Oak have been primary sources of food for the Black Bear, Deer and many other forms of wildlife. This winter, reports of Bears leaving their dens in search of food, many dying of starvation, made mention in the local newspaper (barely). Experts report that because of the ever increasing shortage of food, if something is not done soon, we may witness the extinction of the North Carolina Black Bear.

In response, EarthDance initiated new research sites to test remineralization on Chestnuts and Oaks, in hope that these sites will respond positively and offer a solution to saving the forests that our

During this ten-day period EarthDance members planted 5,000 fraser fir seedlings, and spread some 16,000 pounds of rock dust to selected test sites in the Mount Mitchell State Park.

wildlife are depending on to survive. Something must be done, and remineralization is the only ray of hope that we now have.

We consider this research to be of the greatest urgency. The more funds that become available to us for our research, the more we will do and the faster we will do it. Funding for this work has been provided entirely by the generosity of individual contributors. Every single dollar counts, and believe me they are each stretched out. If you or anyone you know can assist us, please help. We can't do it without you. EarthDance Institute is a nonprofit organization, your contributions are tax deductible. If you will help, please cut out the below form and send it to us.



Mark Fields

Grace MacNeil, 17-years, of Black Mountain, North Carolina during the EarthDance initiative of the summer of 1992.

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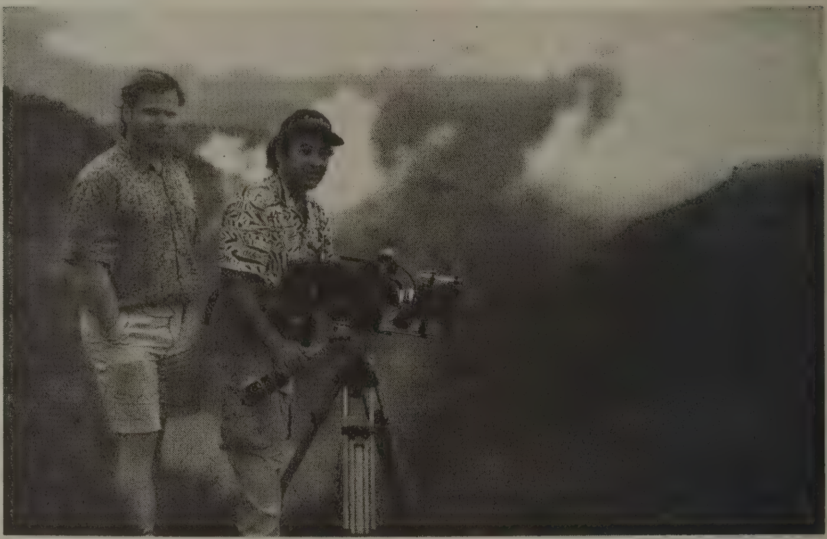
TELEVISION DOCUMENTARY
AIMS TO INSPIRE

by Danny Miller

Question: What is one of the most effective ways to inspire, motivate, and empower young people with a concept that will inspire a responsible stewardship of our environment? The EarthDance Institute believes that tool is *Television,* and has thus joined efforts with Ironwood Productions to produce a nationally televised hour long documentary entitled *The Other Side,* which is currently in production.

According to Mark Fields, Executive Director of the Asheville based EarthDance Institute and the film's Director, Danny Miller of Ironwood Productions, the film will offer straight forward solutions to local and global environmental issues as the young leaders of EarthDance find solutions and take action to solve crucial problems in the mountains of North Carolina and the rain forest of Central America; two ecosystems that are inexplicably interconnected. EarthDance, known for its remineralization work in North Carolina, is dedicated to "providing young people with the support and resources necessary to promote the conscious stewardship of the Earth."

The hour-long film, when complete, will begin in the rainforest of Costa Rica where a group of young teenagers from the U.S. and Spain, discover "the other side" and that saving the Earth's environment begins at home. Meetings with political, corporate and environmental leaders, loggers and indigenous people of Central and North America will demonstrate the complexity of each issue and how young voices can break down many of the walls that have blocked progress before. The film will confront such critical issues as the deforestation of public



Mark Fields

Director Danny Miller and Cameraman Robert Gilbert shooting The Other Side

CREATE AN EARTHDANCE CENTER

At a time when time world is in flux and people grasp for stability and better understanding, the ongoing creation of EarthDance Centers provides an opportunity for us all.

By opening a door for children and teens to come together and delve deeper, to get involved in projects and possibilities, EarthDance Centers also provide a much needed opportunity for hope. With hope, we begin to believe and when we believe in something, things happen.

For those of us who are in the midst of change, looking for new horizons and new ways of being involved, the creation of EarthDance Centers provides a chance to put into practice our concerns and thoughts, to help children and to rediscover, through hands-on experience, that individuals do make a difference.

If you are looking for a new direction and a chance to make that difference, then becoming involved in the organization of an EarthDance Center in your area may be the avenue for you. To see the look on a teenager's face change from frustration to possibility, to watch things grow where they were dying and to begin to feel a sense of community where, perhaps, there was none - what more could one ask for.

When EarthDance Centers and places like them are dotted all over the world filled with concerned and involved teenagers, children and adults caring about the environment, the planet and each other, then we will truly see the world change, and where tomorrow seemed fruitless, there will be life.

If you are interested in becoming involved, please call or write.

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Robert Gilbert

Executive Director of EarthDance Mark Fields with Danny Miller

lands; how air pollution from our cars and factories are impacting our forests; the importance of preserving indigenous cultures; and why our patterns of consumption are destroying an ecosystem thousands of miles away. The program will offer solutions to each of these problems, by including personal interviews (conducted by the EarthDance members) with international and regional experts, and such dignitaries as Dr. Robert Mueller, former Assistant Secretary General of the United Nations.

Thus far they have completed the first phase of Principal Photography and have raised nearly one fourth of the film's total budget. Funding for the film is being raised from individual contributors, corporate sponsors and grants. The project has been recently joined by Cultural Survival (collaborators of *Millennium* the ten-part film series for PBS) and Nosara Productions, based in Costa Rica, who will serve as associate producers of the program. According to Robert Leavitt, Director of Public Policy and Education at Cultural Survival, "the project is an urgently needed one, as it will bring the desperate plight of the Bribri people and the Costa Rican rain forest to public attention."

The film will conclude with the young explorers finding solutions at home, including a major remineralization and reforestation project in the mountains of North Carolina. According to the film's director, Danny Miller, "In the final scene we see the students returning home with a new and profound wisdom. They not only confront those responsible for creating the pollution at home and abroad, (U.S.-owned banana growers/and polluting industries) they also begin taking action, including spreading rock dust to help heal the mountains of North Carolina.

If you would like to make a tax deductible contribution to the film, you may send it to the EarthDance Institute, P.O. Box 2155, Asheville, North Carolina 28802., (704) 252-8188.

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ROCK DUST AND HUMUS

PARTNERS IN A LIVING SOIL

by Barrie Oldfield

Men of the Trees is a worldwide voluntary society of tree planters founded by Richard St. Barbe Baker in Kenya in 1922. The Western Australia branch, begun in 1979, is dedicated to reversing loss of farmland and regenerating the soils of Australia's wheatbelts through forest and shelterbelt plantings and remineralization. In June 1992 Amery Acres, the Men of the Trees' first agro-forestry and soil building trial farm in western Australia, 23 hectares of impoverished dryland at Dowerin, was ceremoniously and officially opened.

RE #3 (Spring 1992) featured two articles by the Society's president, Barrie Oldfield, on soil improvement and the 1991 remineralization field trials at Amery Acres. RE applauds the work of Men of The Trees, and extends congratulations and encouragement to Mr. Oldfield's group.

> *"This project is a window into farming for the twenty-first century. We shall discover how a family can make a living from a farm of perhaps 500 acres, with all that that implies for the future prosperity of country towns like Dowerin."*

Beginning the Work

Soil samples taken from various locations at Amery Acres indicate a range of surface soil types varying in depth from 10 to 30 cm. (1 in = 2.54 cm) There are sandy loams, pallid sands, quartz gravels, and in one small area deep 'gutless sand'. Underlying all is a mottled clay (White Gum country) or a lateritic gravel (Tamma country). Both subsoils are highly compacted. All cultivated soils are acidic, in the range pH 4.9-5.4., they also lack humus, and contain little available plant nutrients. They are typical of the eastern wheatbelt and are generally known as *duplex soils*.

A major purpose of the trials is to test the theories of remineralisation. However, the first year the most effort will be put into establishing the tree shelter belts. Rip lines have been cut using a D8 bulldozer and penetration to 80 to 90 cm has been achieved. Using an auger driven from the tractor PTO, tree planting spots in the rip lines have been worked up and blended with approximately 7-9 kg (2.2 lb = 1 kg) of granite rock dust (5-7 litre/1 liter = 33.8 fl. oz) per tree. The technique worked well as the clay was still very dry following summer. The dust quickly mixed with the clay particles and passed down into the rip. The dust, with its high pH of 8.6, will help neutralise soil acidity and make freshly cut igneous rock material available to stimulate biological processes.

It is anticipated that roots of tree seedlings will penetrate to depth in the first season, thus

Sue Turner checks the growth rate of these seedlings which have exceeded all expectations.

Following ripping with a Cat D8 this Ford Dextra tractor and auger worked up each planting spot blending clay and rock dust together. Pictured: Peter Johnston and Cathy Hubble

assuring a good survival rate through the first summer. However, had good rains fallen earlier, the clay might have been too wet to work in this way. Experience has shown that a wet clay glazes under the auger and effectively confines root growth.

In the top 10 cm extra humus has been incorporated as available. Hearing of the project, the Perth Zoo has so far donated 16 tonnes of well composted animal manure and bedding material from the Zoo's herbivores. This has been blended into the surface soil beneath a top mulching of newspaper or old carpet [non-synthetic] and forest litter. In addition each tree has been given a 10 g Bailey's plant pill – a slow release fertilizer containing N, P, K, Mn, Cu, Zn, and Mo.

Window into the 21st Century

Describing the Amery Acres Project to the Dowerin Shire Council, Shire President C. Wallace Jones said, "This project is a window into farming for the twenty-first century. We shall discover how a family can make a living from a farm of perhaps 500 acres, with all that that implies for the future prosperity of country towns like Dowerin."

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TREE CROPS ON MODEL FARM HACIENDA ATIRRO IN COSTA RICA:

An Opportunity for Remineralization?

by Dr. Herster Barres

The Turrialba Valley Scene – A melange of young macadamia (front), sugarcane on the valley bottom, coffee on the middle slopes and natural forest and brush on the hills.

Dr. Herster Barres has been active in forestry development in Costa Rica for over 30 years. As an ex-U.N. forestry expert and developer, he is not only a capable expert in silviculture, but specializes in the application of research results to society. His efforts on the development of macadamia as a farmer crop has taken Costa Rica from a non-producer to the world's third largest producer of macadamia nuts. Today, there are hundreds of farmers involved in over 13,000 acres.

One of the farms with which he is involved, Hacienda Atirro, is structured as a model farm illustrating the use of trees as a major source of economic production. The surprising aspect of this project is that it is not just a concept for the future, but has been going on for 26 years and is showing real economic numbers.

He is currently doing rock dust trials with various samples of rock dust from the U.S. and eventually hopes to produce rock dust locally for the farm and other farmers.

Hacienda Atirro is a large farm of over 3,000 acres in the sub-tropical Valley of Turrialba, at an elevation of 2,000 feet. Rainfall is about 100 inches each year, about 2 1/2 times what Connecticut, for instance, receives. The farm is in a valley surrounded by mountain slopes. There are many areas in Latin America similar to this one.

Sugarcane is planted on the flat valley floor, a necessity due to the use of tractors to haul this low value, but heavy, raw material.

Of course, coffee used to be an important crop, and still occupies an important portion of the land. Coffee is produced from a small tree or bush, a permanent cover on the soil. There is almost no erosion under a well-managed plantation, even on very steep slopes. While coffee prices now are very low, it is a tree crop that generates an important cash flow.

Years ago, 26 years to be exact, I began promoting the further development of tree crops to the owners of Hacienda Atirro. At the time, their business was entirely sugarcane, coffee and their associated industries. It became clear to the Costa Rican managers of the farm that they would be faced with increasing labor costs to harvest the coffee as wages climbed and as the country developed. They were definitely open to considering other crops.

At that time, working as a UN Forestry specialist, I proposed plantations of fast-growing tropical trees and macadamia. Today, along side and above the coffee, are almost 2,000 acres of macadamia nuts, and acres of forestry plantations. Nestled in the valley is a modern nut processing plant, seasonally employing up to over 100 people, while many others are involved in the harvest. Several hundred other farmers have now followed their lead and have made macadamia plantations a part of their farm structure. About 85% of the production of macadamia nuts in Costa Rica flows through this factory.

The partners of Hacienda Atirro have even gone outside the traditional agricultural pattern in Latin America of being only raw material producers who sell truckloads to brokers in the developed countries. They took care to establish a marketing office in the U. S. to sell directly to industrial users at very reasonable prices. This office telemarkets macadamia in 25 lb boxes to small and medium-sized businesses. Sales are even made to Japan.

Thus, we have a direct link between a concept of economically producing trees on a valley slope in Costa Rica and the industrial users in the United States and abroad. Everybody benefits, especially the environment.

The next stage of development which is just starting to take shape is to establish tree plantations of a third generation fast-growing tree species on the upper slopes of the productive area. The tree, a rare species from New Guinea, is the result of thirty-five years of research. It shows great promise of being a supertree under tropical conditions.

A landuse pattern is beginning to emerge:

1) heavy, low value by weight, cane in the valley
2) higher value coffee and macadamia nuts on the middle slopes
3) fast growing tree plantations on the upper middle slopes
4) the untouched, natural forest with its advantages on the topmost, steepest slopes and peaks.

Macadamia fruit on the tree

In addition the important, job creating elements are, of course, the processing plants along the roads, a sugar mill, a coffee processing plant, and the macadamia processing plant, a few hundred feet from the production areas.

Finally, there is the marketing office in Mystic, Connecticut, the link to the consumer.

Where does rock dust fit in? These farm operations produce tons of organic matter which are composted and reapplied as organic fertilizer to the plantations from which they came. These are: coffee bean husks, bagasse [crushed sugar cane refuse] and filter mud from the sugar mill, and macadamia husk. The shell of the macadamia and part of the bagasse are burned for energy production to power the factories. A strong flow of water from mountain streams powers a generator for production of electricity. The farm is a net producer of energy.

In spite of these large volumes of organic matter, about $500,000 of chemical fertilizer is used each year on Hacienda Atirro. Sales of chemical fertilizers in the immediate valley to other farmers and cooperatives probably add up to several million dollars. There would appear to be a wide-open market for a locally produced rock dust plant, if indeed, it proves to be an economical substitute for a part of the chemical fertilizers used. This may be a new industry for this farm, the production of a bagged fertilizer of rock dust in a mixture with the organic matter.

There is enough literature available to justify cautious optimism about rock dust as a new "crop" for this model farm. If effective and economical, there is a ready and willing market of considerable size awaiting this potential product, on the model farm itself, in the Turrialba Valley and in Costa Rica. For Hacienda Atirro, it would mean another processing facility to add to the group, with resulting jobs and efficient use of the local natural resources, benefiting productive farmers in the private sector and in cooperatives.

Initial trials with rock dust have already begun on a small scale.

CARING FOR OUR EARTH

Min Plus A Rock Dust Fertilizer

Taking off in Australia

Jon Grant

Sam Catalano with volcanic rock, pure form

by Gavin Alder

A herd of cows may have found the answer to land degradation problems in North Queensland. A decade ago, cane farmer Sam Catalano watched in fascination as the cows crossed a stream, ignoring its clear waters to drink water used to wash down equipment at this quarry.

"It stunned me. I couldn't work out why these cows would ignore crystal clear water in a stream to drink muddied water," Mr. Catalano said. "I couldn't get it out of my mind and so had the rock analysed and the conclusion we reached was that the cows were replenishing their nutrient levels by drinking the water because the equipment had been working in an area of volcanic rock rich in minerals and nutrients."

From this observation ten years ago, Mr. Catalano has worked tirelessly on the theory that this volcanic rock in powder form could be used to lift soil quality in the most natural way possible.

Soil degradation through overuse and leaching has become a major concern. Once rich soils have been left nutrient deficient through continual cropping. For the farmer this represents a vicious circle. The worse the soil, the more fertiliser required to maintain yields and the more fertiliser required the more degraded the soil becomes. It's costly and, in many ways, a self defeating process, and, of course, research has shown the use of chemical fertilisers has serious consequences for our environment. The chemicals leach into streams and rivers before being flushed out into the ocean.

This is causing great concern among scientists and marine biologists in North Queensland, who believe it results in increased algae levels in the waters of the Great Barrier Reef. In the southern states outbreaks of green blue algae are killing rivers like the Murray.

It's a vicious circle that Sam Catalano believes can and must be broken. A cane farmer from the Innisfail district, he has developed Min Plus, a fine dust produced from the naturally occurring volcanic rock at this quarry.

"There's no secret formula," Sam said, "the product is simply ancient volcanic rock containing mineral nutrients, which has been ground into a fine powder."

Since the mid 1980s Sam and a group of farmers and scientists in far north Queensland have conducted trials on Min Plus. So outstanding were the results that he began marketing the product in the

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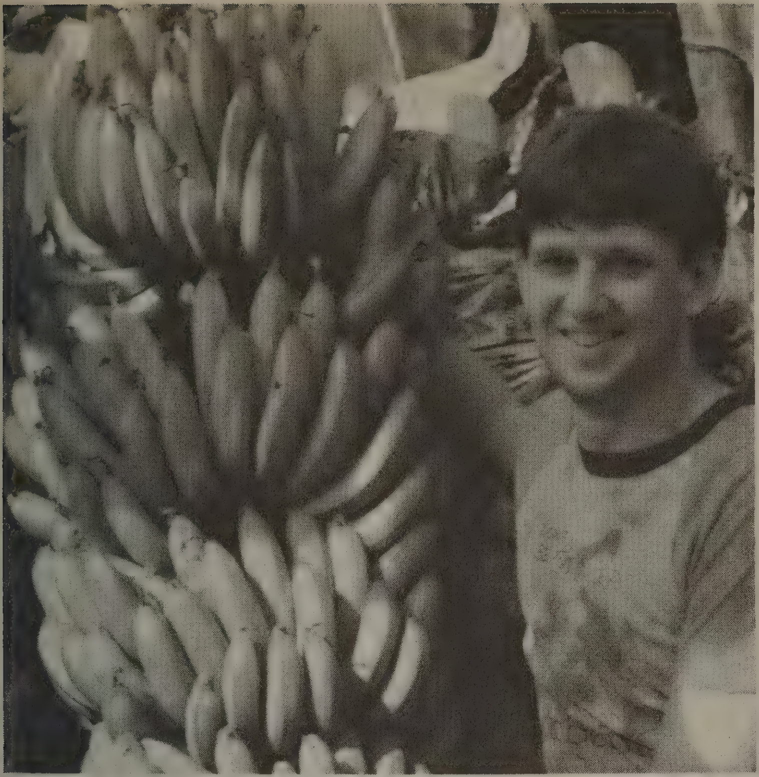
Gavin Alder has been a news journalist in Australia and the United Kingdom and in 1988 won the Thorn EMI journalism Award. He has been Bureau Chief for North Queensland Television. He is now Manager of NQ Media Services, an independent television production/public relations company.



Jon Grant

Healthy bananas grown with Min Plus

"There's no secret formula," Sam said, "the product is simply ancient volcanic rock containing mineral nutrients, which has been ground into a fine powder."

far north earlier this year with equally spectacular results.

"People are more concerned about the environment," he said. "They are looking for alternatives to chemicals because they have seen what happens after years of taking from the soil without putting anything back."

Many people turn to organic fertilisers like manure, a move applauded by Mr. Catalano, but with this warning: "People must remember manure comes from animals and if they have been fed growth stimulants, antibiotics and other drugs and chemicals, they will be present in the manure.

While there are dozens of cane growers, banana farmers, small crop growers and others who sing the praises of Min Plus, the mineral rock dust is also gaining favourable comment from the traditionally cautious scientific community. Tests are being carried out in the southeast corner of the state by the Institute for Sustainable Tropical Agriculture and Resource Management at Queensland University.

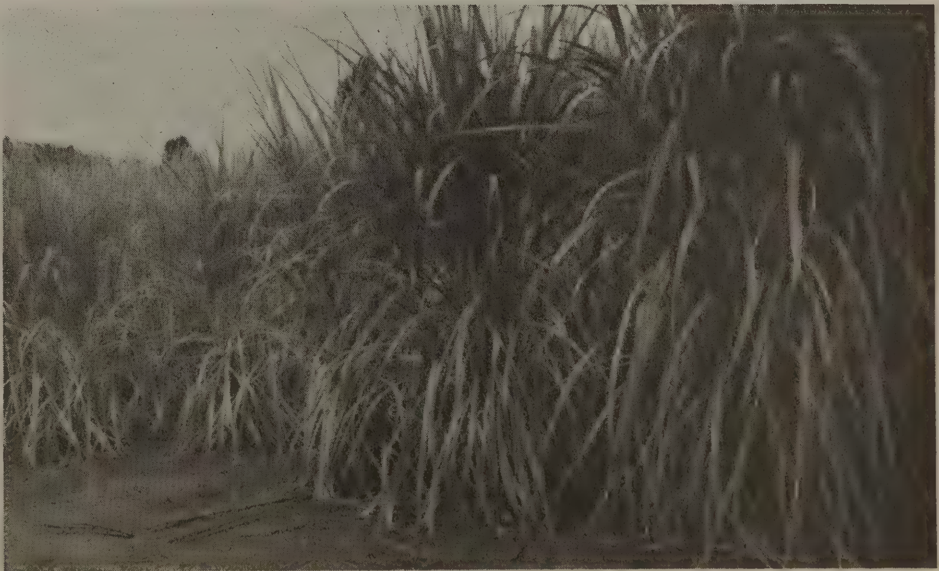
In the tests carried out on soybean and maize, application of Min Plus resulted in rising yields of the crops. The increase was found to be most dramatic in soils which had been more severely degraded and therefore nutrient deficient.

Over the years Sam Catalano has had tests carried out in soils in far north Queensland, particularly around the Innisfail district where sugar cane has been grown since early this century.

The results of those tests show there is a serious deficiency in calcium and magnesium in 70-80% of the region.

Basing Min Plus application on a standard rate of one tonne per acre, he and others have found a 200-250% improvement in the levels of these minerals.

It's Sam Catalano's belief that by using Min Plus land owners will reduce their use of chemical fertilisers, thereby saving money, improving their soil and caring for the environment.



Jon Grant

Remineralized sugar cane on the right compared with the unremineralized cane on the left.

REMINERALIZATION TRIALS

Min Plus and Bananas

Cost Benefit Study

by T.D. Edwards

Jon Grant

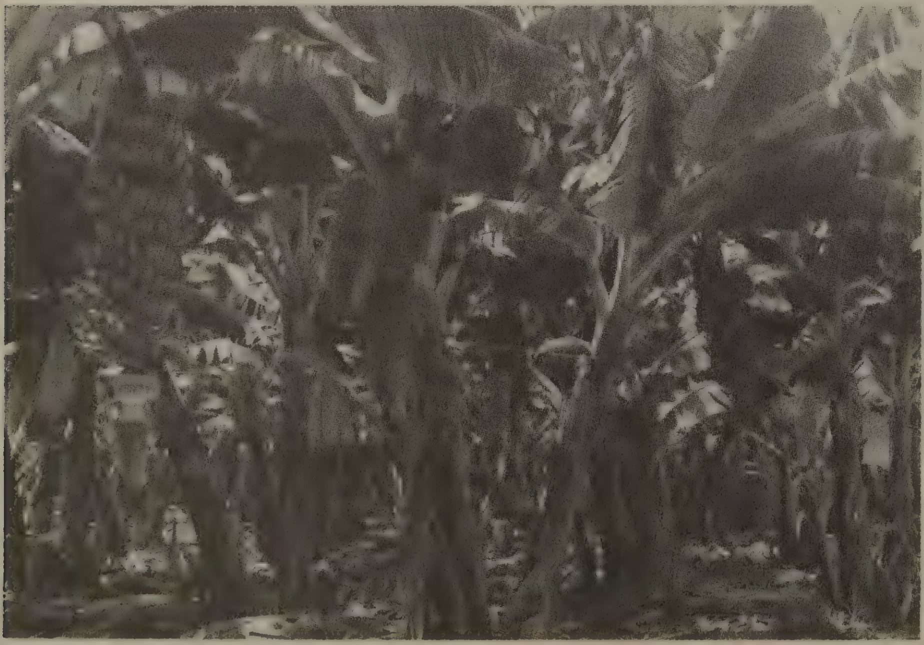
Sam Catalano with remineralized bananas.

Australian banana growers Kevin and Gary Harding have been trialing rock dust from Pin Gin Hill quarry since mid-1985. Using experience gained from these trials they radically altered their fertilizer applications, and in August 1990 planted out a 4-hectare block using Min Plus rock dust as the main fertilizer.

The Harding Brothers farm is on the Palmerston Highway 15 kilometers west of Innisfail. Bananas are grown in pairs at 1.8 meters spacing in loamy riverflat soils of basalt origin. The rows are 5 m apart, giving a stool density of 2,200 per Ha (hectare). Each 2 Ha "block" of bananas is cropped for 4 years and then fallowed by plowing in sorgum and chick pea.

The results of using Min Plus on the Harding Brothers farm are as follows:

1. Urea and Potash applications have been reduced by 80%, thus giving significant savings in fertilizer costs and minimising environmental damage caused by run-off contamination.



Jon Grant

The Harding banana plantation 4-hectare block planted with Min Plus rock dust.

2. Dolomite application has been halved and at 16 months there is no sign of magnesium deficiency. This deficiency was a problem prior to using Min Plus.
3. The banana plants are more healthy with vigorous root systems and 25% heavier yields.
4. There is a 20% increase in growth rate resulting in a faster turnoff of fruit.
5. The sum of these benefits has resulted in an incredible 80% increase in production with a substantial decrease in fertilizer cost.

COST BENEFITS OF MIN PLUS IN BANANA GROWING

For the purpose of analysing cost benefit the following fertilizer costs and banan prices have been used:

Urea	$21.66	per	50 kg bag
Potash	$32.00	per	50 kg bag
Dolomite	$140.00	per	tonne
Min Plus	$125.00	per	tonne
Bananas	$10.00	per	14 kg carton (ave.)

A. Fertilizing

		With Min Plus		Without Min Plus	
		p.a.	$	p.a	$
New Application rates					
Urea	43 kg/Ha/3wk	745 kg	$323		
Potash	53 kg/Ha/3wk	918 kg	$588		
Dolomite	1.88 tn/Ha/yr	1.88 tn	$263		
Min Plus	11.25 tn/Ha/4yr	2.81 tn	$351		
Previous Application rates					
Urea	500 kg/Ha/6wk			4.33 tn	$1876
Potash	500 kg/Ha/6wk			4.33 tn	$2771
Dolomite	3.75 tn/Ha/yr			3.75 tn	$ 525
			$1525		$5172

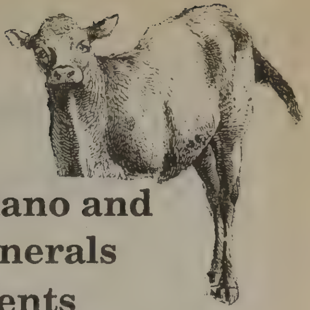
Fertilizer Saving Per annum = $3647/Ha

B. Production Increases

	With Min Plus	Without Min Plus
Suckers Planted/Ha	2,200 stools	2,200 stools
Potential maximum crop		
With Min Plus = 6 picks/4yrs	13,200 bunches	
Without = 5 picks/4yrs		11,000 bunches
Less bunch losses due to wind, nematodes, insects, disease		
With Min Plus = 5%	-600 bunches	
Without Min Plus = 20%		-2,200 bunches
	12,540 bunches	8,800 bunches
Fruit packed per bunch (av.)		
With Min Plus	3.8 cartons	
Without Min Plus		3.0 cartons
Harvest for 4 yr period	47,650 cartons	26,400 cartons

Increased Crop Value per annum = $53,125 /Ha

TOTAL COST BENEFIT per annum = **$56,722 /Ha**



Sam Catalano and Pacific Minerals Developments

I started farming when I left school, and noticed that wherever there were stones in the fields everything grew better and was more resistant to drought, disease and pests. I often wondered why.

In 1982 I established a quarry in the middle of a cattle run. After the first operation the cattle would sit on the ridge opposite the plant until we washed the plant in the afternoon, then they would walk through clean water in the adjacent stream to drink the wash water from the plant.

Following that, their grazing habits changed to the downwind side of the crushing plant where the fine dust was depositing. All this coupled with my previous experience of crops growing better in the presence of rocks led me to ask questions, bringing me into contact with Dr. Gavin Gillman of CSIRO, Townsville, who had previous experience with rock dusts in Hawaii and was continuing his work in Australia. After Dr. Gillman left Australia I transferred my work to Queensland University with Dr. Ross Gutteridge and Chris Searle.

In 1987 I established Pacific Mineral Development Pty. Ltd. to research and process mineral rock dusts. In 1991 I commissioned the first plant in Australia to fine grind dry volcanic rock dust to minus 380 mesh.

Sam Catalano
Pacific Mineral Developments
594 Innisfail, Queensland
Australia
Phone: 61 70 644 118
Fax: 61 70 644 131

MAKING COMMUNITIES MORE SUSTAINABLE

by Joanna Campe

Make use of a little used and valuable resource – recycle minerals and trace elements with finely ground gravel and rock dust, especially glacial moraine or mixtures of gravels that contain a similar broad spectrum of minerals and apply it to soils in agriculture, community and family gardens, tree planting, park and forestry projects.

Remineralization regenerates soils for agriculture, forests and all biomass, contributing to the health of all life and restoring ecological balance. It replaces expensive chemical fertilizers and pesticides which contribute to soil degradation and pollution of the water supply, thereby replacing future pollution with future regeneration. It contributes to climate stabilization.

Remineralization causes a phenomenal growth of microorganisms in the soil. It increases the nutrient intake of plants. It counters the effects of soil acidity, prevents soil erosion, increases the storage capacity of the soil, contributes to the building of precious humus complexes, has anti-fungal properties, and when sprayed on plants it repels out-of-balance insect infestations as well. The plants and trees become highly resistant to insects, disease, frosts, and drought. It also enhances and speeds up the process of composting.

Sustainable Business Enterprises

Small local and regional businesses can create products and municipal governments can utilize SR to their economic benefit. Products with names like EarthWealth and Nutristone are emerging and cities are finding they can turn sewage sludge treated with rock dust into agricultural fertilizer and other uses.

For Agriculture, Community and Family Gardens:

John Hamaker, co-author of *The Survival of Civilization* estimates that on fully remineralized soil, American agriculture could grow *four times* as much food as it is capable of now – or the same amount of food at about one-fourth the cost – and with no pesticides or chemical fertilizers.

The best source of soil minerals is simple crushed gravel dust. In 1976 John Hamaker spread gravel crusher screenings on part of his ten acres in Michigan. The following year, in an area of sparse rainfall and dry summers, and with no irrigation, his corn produced 65 bushels per acre, compared to yields of under 25 from other local farms. Moreover, when independent analyses were done, Hamaker's corn was found to contain 28% more protein, 47% more calcium, 57% more phosphorus, 60% more magnesium and 90% more potassium than the same type of corn grown with chemical fertilizers nearby.

Regeneration of Forests and Trees:

The results of long term experiments released in 1986 in Germany showed that *in a forest where pine seedlings were remineralized, after 24 years the wood volume was four times higher* than in the untreated area. One application lasted 60 years. (The Bavarian Research Institute in Munich).

In Australia, *Men of the Trees* is doing trials on many different tree species and has seen increased growth rates of five times over the controls for some species.

In a recent interview, Robert Bruck, Ph.D., forestry expert and Director of the Environment for North Carolina said the greatest concern is the chronic, long-term implications of air pollution and this is where soil remineralization comes in. As scientists become more interested not only in what the problem is, but what to do about it, forest fertilization or *trace mineral* fertilization, is coming to the forefront.

The spruce and Fraser fir trees that cover Mt. Mitchell, North Carolina's more that 12 sq. mi. of rolling slopes have died in massive numbers since the 1970s. About 7 1/2 sq.mi. of Mitchell's trees are now dead or nearly dead, by Bruck's estimates. Students and members of the EarthDance Institute sprinkled a mineral-rich powdered rock on seedlings newly planted on Mt. Mitchell. Studies in Europe have shown the dust can be beneficial in reforesting areas like Mt. Mitchell that have been devastated by acid rain.

The results 12 weeks after application were height growth of red spruce increased by 27% over non-treated controls, and height growth of Fraser fir 19% greater...The general appearance of treated trees was that of a very dark green color and good flushing of 1991 tissues, whereas untreated controls appeared to be somewhat yellow and chlorotic. Robert Bruck and graduate students at North Carolina State University will return to Mt. Mitchell for the next few years to monitor soil analysis, tissue analysis, including chlorophyll content, and a complete survey of height growth, root collar diameters, and survival of trees.

Using Valuable Local Resources That Are Otherwise "Going to Waste"

Remineralization is often able to take advantage of a regional or local community resource, gravel, which is currently unused and often buried in ponds. What is considered a waste turns a problem of disposal for the aggregate industry into a potential market. Much of the gravel used for roads, highways and construction can also be used for restoration of soils and forests. A village in the national park of the Hohe Tauern region in Austria where tungsten is mined buried the rest of the gravel in a lake. The left over gravel dust is now being made available to local farmers.

Transforming Sewage Sludge

Gravel dust can be used for municipal composting and treatment of sewage sludge. It can transform sewage sludge into a potential product that can be made available to local farms, gardens, tree planting, city parks and forests.

N-Viro or Advanced Alkaline Stabilization Accelerated Drying won first place in the Technology Development Category of the EPA's 1990 National Sludge Use Awards Program. In the non-governmental sphere, this process was given a special Earth Day Award by the National Environmental Awards Council's "Renew America" campaign. The National Certificate of Special Merit was awarded for outstanding achievement in the area of solid waste reduction and recycling.

The end result is a substance which resembles a cross between a fertilizer and soil. N-Viro products can be used as a granular fertilizer, soil conditioner, topsoil substitute or construction material. Odor reduction and heavy metal fixation are substantial benefits of the process. The pungent aroma of sludge disappears almost immediately upon mixing it with cement kiln dust. It is much more acceptable to communities than other sludge treatment techniques due to the significant reduction in odors. Processing takes only ten days and therefore has smaller land requirements that other treatment methods. A facility can be designed and built in less that six months because of its small size, low technology requirements and ability to use standard construction equipment.

This type of product should be considered for aiding forests and city parks damaged by acid rain. In order to restore health to forests we need not only to bring the pH back to normal levels, but also to reintroduce minerals to the soil. Sludge combined with the appropriate rock dust could be produced cheaply in every region.

Biological Activator Bio 2, of Meridian Environmental Group in Michigan, is a product created with gravel dust and used to accelerate wastewater treatment. It increases biological digestion by 300%. It is designed to increase the metabolic activity of digester bacteria in a wastewater treatment system. It is non-toxic, non-corrosive, and has no chemical additives. It is applied to the influent stream of a biological waste processing system and can be used in most any type of press, i.e., activated sludge content, extended aeration, step aeration, anaerobic digestion, sludge stabilization, etc. A 200-500% increase in bacterial action can be expected that results in increased processing capacity, increased nutrient immobilization, decreased volatile solids, fast "shock" recover, reduced D.O.C. (dissolved organic carbon) and improved sludge quality.

The National Aggregate Association has a Task Force on Remineralization exploring the possibilities for creating sustainable products for agriculture, forestry and so on. The Association is beginning to recognize its potential and is creating a proposal for review as a project at the Center for Aggregate Research.

Please contact us at ***Remineralize the Earth*** if you'd like to consider ways to make your community more sustainable through remineralization.

This paper was presented at the Exploring Community Sustainability – Workshop 1, 26th Annual Federal Workshop on Urban Environmental Design, co-sponsored by S.U.R.E. Exchange and the American Institute of Architects with the cooperation of H.U.D. held at the American Institute of Architects Headquarters, Wash. D.C., Nov. 19-20, 1992, lead by Andrew Euston. To get the S.U.R.E. Exchange newsletter write P.O. Box 11343, Takoma Park, MD 20913, (301) 588 7227.

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gardeners in community *Newsletter*

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Aspirations and Intentions

To nurture that Spirit which enobles and enables.

To elevate vegetable gardening to a state of art, to produce wholesome food, beautify the land and work co-creatively with mother nature.

To aid the churches to incorporate vegetable gardening projects into their ministries as they reach out to help the poor, heal the sick and renew our earth.

To assist John Jeavons in alleviating hunger and malnutrition through the Biointensive method of horticulture.

To assist Habitat for Humanity in making gardens where they are building houses.

To publish a booklet, a guideline for the churches: how to start an ecology ministry in food gardening.

To publish a booklet on the benefits of the Butternut squash, including instructions for culture and storage, special designs for squash gardens and delicious recipes.

To inform gardeners about using rock dust for a healthy soil microbiology, necessary for a healthy flora and a healthy human population.

TASK FORCE ON REMINERALIZATION

The National Aggregate Association meets with Department of Agriculture on remineralization, Don Weaver speaks at NAA annual convention

by Joanna Campe

Hundreds of thousands of tons of appropriate rock dust for soil and forest regeneration are stockpiled by the gravel industry throughout the country and considered by-products. This material has the potential to transform agriculture, forestry, health care, sewage sludge treatment and create thousands of new jobs.

The forming of a Task Force on Remineralization by the National Aggregate Association is a tremendous breakthrough for the networking and promotion of remineralization on the national level. It came about through meetings with **Remineralize the Earth** *contributing writer, David Yarrow, and Robert J. Able, of Gernatt Gravel Products Inc., of upstate New York, and subsequently through the interest and efforts of Bob Able. Bob Able later contacted and has been in frequent touch with* **Remineralize the Earth,** *and a tremendous amount of networking, fact inquiring and gathering has taken place in the last year and a half.*

When the Workshop on Community Sustainability was held in Washington, D.C. at the American Institute of Architects on November 19-20, 1992, lead by HUD architect Andrew Euston, Richard C. Meininger, Vice-President of Research of the NAA attended the brief presentation on "How Can Remineralization Make Communities More Sustainable?" (See article on page 30). This lead to an invitation to meet with the task force on February 2, 1993.

The Task Force on Remineralization of the National Aggregate Association held an Ad Hoc meeting on Feb. 2 in Silver Spring, Maryland.

Attending from the industry were Robert J. Able, Task Group Chairman, Richard C. Meininger, NAA Vice President of Research, Anthony Arnold of Material Sales Co., Bob Grauer of Luck Stone, David W. Jahn of the American Aggregates Corp., Sandy Wood of Vulcan Minerals Co., and Richard D. Gaynor, Richard A. Morris, and Timothy A. Jemal of the NAA staff.

Also attending from the U.S. Dept. of Agriculture, Agriculture Research Service, Beltsville, MD was W.D. Doral Kemper, head of National Programs on Soils and Ron Korcak, Fruit Lab and the Program on Use of Industrial By-products in Agriculture.

Also attending were Andrew Euston, Architect and Coordinator of the Program on Community Sustainability with HUD; Greg Watson, Commissioner of the Massachusetts Department of Food and Agriculture; and Joanna Campe of ***Remineralize the Earth***.

These themes were explored:

The market potential for remineralization with general market data needed in the future. The evaluation of byproduct aggregate fines for their suitability. Since each aggregate source will have a different mineralogy, it would be important to obtain a complete elemental test analysis including quantities of trace elements to both assess its value to crop, plant, and tree growth and to make sure that there were not any harmful elements of substances in the fines.

The potential problems of health and safety would have to be identified and investigated to make sure that the use of gravel or rock dust will not prove to be detrimental in any way.

Methods need to be found to either dewater the fines economically or to handle and spread the material while wet, and for the pelletizing of fines.

Legislation and regulations that would effect fines being used as a soil amendment will be explored.

There was a discussion concerning potential research that might be done, in conjunction with USDA research and the NAA, through the Bureau of Mines, Center for Aggregates Research, Texas A & M, or other university programs. Initial work might be aimed at areas of the country where good soils are in short supply or have been depleted, in particular, warmer humid areas. Comparative plot tests should be done to show its application in the U.S. There was also a discussion about how to get international technical papers and experience into the agricultural libraries and literature in the U.S. The topic of sustainable agriculture is becoming more important in the USDA and more work will be done in this area in the future. Some of the potential applications were identified: sustainable agriculture and gardening, forests and the forest products industry, nursery growers, mixtures for golf courses, the turf grass industry, homeowners and lawns, sewage sludge, composting, and biomass power production.

It was noted that a comprehensive article was published by Steven Stokowski, Jr. in the January, 1993 issue of *Rock Products Magazine*, pp. 37-43. He reviews the properties of the fines and many potential uses.

Greg Watson indicated that he could help get the needed actions at the state level to utilize aggregate fines in sustainable agriculture and it may also have a place in integrated pest management programs.

Andrew Euston of HUD, also a strong advocate of SR, spoke about SR for community sustainability, and the need to encourage the USDA to move in this direction.

Committee members were presented with research packets for Agriculture and Forestry by Joanna Campe. Also available was a portfolio of photographs showing results of SR.

It was also requested that the association consider supporting the Dellums bill, H.R. 970. The bill calls for remineralization as part of a climate stabilization program. (p. 42)

Don Weaver was a speaker at the National Aggregate Association Annual Convention held in San Antonio, Texas, February 21-25, 1993.

A presentation on the "Use of Aggregate Fines for Remineralization" was made by Robert J. Able on March 16, 1993 at the First Annual Symposium of the International Center for Aggregates Research. ICAR is located at the University of Texas at Austin and Texas A&M University and will be sponsoring a symposium each year to review current research and applications of aggregates technology as well as identify the technological and educational needs of the industry. There was considerable interest in SR at the symposium by the Aggregate Industry.

A Sub-Committee Task Force on Remineralization, chaired by Mr. Able has been set up. The Committee currently is developing a University research project on remineralization to establish various facets of the concept.

> ***Hundreds of thousands of tons of appropriate rock dust for soil and forest regeneration are stockpiled by the gravel industry throughout the country and considered by-products.***
> ***This material has the potential to transform agriculture, forestry, health care, sewage sludge treatment and create thousands of new jobs.***

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FIRE AND ICE

by Greg Watson

"If Gaia exists, she likes it cold."
James Lovelock

Greg Watson, an old and valued friend and the former director of the New Alchemy Institute, is Commissioner of Agriculture for the Commonwealth of Massachusetts. It is not an easy job in a state where agriculture is not seen as a major priority by many people in or out of government. But Greg has fought hard, occasionally risking his career, to protect the interests of farmers. In doing so, this urban-raised devotee of Buckminster Fuller has won their heartfelt respect and loyalty. Long a proponent of soil remineralization, in this article he makes a compelling case for establishing programs that would launch the practice effectively. Editorially, it might be added that he and John Todd are hatching a plan to share a rock crusher and get started at once on local remineralization.

Nancy Jack Todd
Editor, *Annals of Earth*

In a recently published article in *Nature*, Anne de Vernal and Gifford Miller, researchers at the Universities of Quebec and Colorado, pose a startling question.[1] The question, "Will greenhouse warming lead to Northern Hemisphere ice sheet growth?" appears to fly in the face of traditional scientific wisdom regarding global climate change. De Vernal and Miller's examination of the geologic record stored in Arctic ice cores suggests that greenhouse warming, which many scientists warn will ultimately melt the polar ice caps and result in massive flooding of coastal areas, may instead lead to the growth of polar ice caps and could actually hasten the next ice age.

The ice cores studied by de Vernal and Miller reveal that prior ice ages began in periods when the Earth was, on average, at least as warm as it is today. Because the Arctic is so far north the warmer summers of these periods were not able to melt much ice. In fact, de Vernal and Miller hypothesize that warmer summers led to increased evaporation of the oceanic waters near the equator. Strong winds generated by the temperature gradient probably carried this moisture-laden air towards the cooler poles where it precipitated out as snow. As snow accumulated and glaciers grew, the pressure from the additional weight resulted in the outward basal expansion of the glaciers.

Strange as it may seem at first, the above scenario comes as no surprise to a group of scientists and concerned activists who, using a "Full Climate Cycle" model of climate change, predicted the same connection between greenhouse warming and glacial buildup as long ago as 1982. Moreover, the Full Climate Cycle's holistic representation of the Earth's climate system led this group to identify the changing mineral content of the Earth's soils as the critical link between these two phenomena.

The Full Climate Cycle model indicates that, since the termination of the last ice age some ten thousand years ago, key minerals have been depleted from many of the Earth's soils and are no longer accessible to plants. Many of these minerals, even those usually present only in minute quantities, are essential to life. They support the microorganisms in the soil that nourish green plants. These in turn support all of the creatures incapable of producing their own food, including humans. Such depletion of soil minerals is a natural result of ecological succession.

As soils become deficient in minerals, plants, particularly trees, begin to die off. As the trees die they release stored carbon into the atmosphere where it combines with oxygen to form carbon dioxide. Higher levels of carbon dioxide contribute to the greenhouse effect, which de Vernal and Miller suspect may trigger glacial advances.

Ice ages are arguably nature's most effective mechanism for restoring lost minerals to the soils, albeit a disruptive one. When glaciers advance their tremendous weight grinds and crushes rocks, reducing them to a fine dust. Dust is a form that allows microorganisms access to hitherto unavailable minerals.

This article is reprinted from Annals of Earth, *one of the ecological publications that has most inspired me over the years.*
J.C.

Ice core records tell us that there have been as many as thirty ice ages over the past three to four billion years (I still remember my high school science texts' references to the "Four Great Ice Ages"). These ice ages have appeared, like clockwork, in one-hundred-thousand-year cycles. What is most surprising (some might even say disturbing) about the Earth's recent history (that is to say the past four billion years) is the fact that for roughly ninety percent of each hundred-thousand-year cycle glaciers have been advancing. At their point of greatest extension, sheets of ice as great as a mile thick have covered Central Europe, Asia and Siberia. In North America glaciers have blanketed New England as far south as Cape Cod and in the Midwest they have extended all the way to southern Ohio

Proponents of the Full Climate Cycle model argue that a strategy designed to restore mineral balance to the soils is key to arresting massive forest die-offs and averting climatic instability. A number of experiments in soil remineralization have been undertaken around the globe in recent years. Some have already begun yielding positive results.

As has been noted, the Full Climate Cycle model flies in the face of the accepted theory of greenhouse warming, which predicts that the continued introduction of carbon dioxide and other heat-trapping gases into the atmosphere will lead to an overall warming of the Earth. It is generally believed that ice caps will melt, sea levels will rise, and coastal areas will be flooded. How, then, can there be such radically different predictions based on the same phenomenon?

Daniel Botkin, Professor of Biology and Environmental Studies at the University of California at Santa Barbara, has written a timely but relatively unheralded book, entitled *Discordant Harmonies: A New Ecology for the Twenty-First Century*, which may shed some light on this puzzling question. Botkin argues that some of our long-held notions about "how the world works" may be obsolete. He suggests that in order to understand and successfully address the major threats to the environment - global climate change, stratospheric ozone depletion, acid rain, deforestation etc. - we will need to re-examine (and possibly abandon) many of the "age-old myths and metaphors that shape our perception of the natural world."[2]

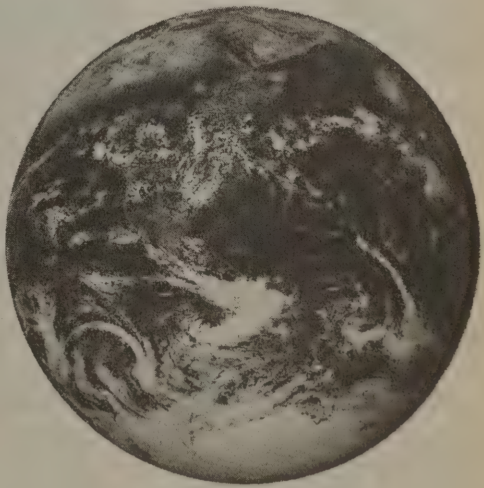
One enduring perception currently in question is the notion that, in the past, ice ages have been few and far between. The theory that the Earth's history has been punctuated by a number of cataclysmic events challenges the belief that slow and continuous change is the norm in nature. In recent years anthropologist Steven Jay Gould and scientists from diverse fields have argued that "punctuated equilibrium" is one of nature's primary means of change.

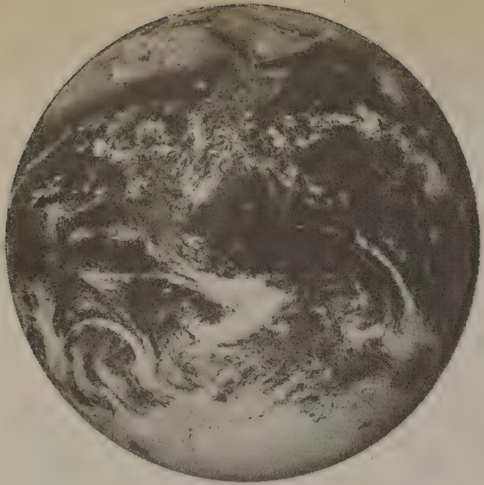
Another notion that is being reassessed is the concept of a lifeless Earth serving as a substrate, if you will, for the fragile thin film of living matter that is the biosphere. According to this view, life is passive, at the mercy of the ever-changing physical landscape of the Earth. This notion is being challenged by a highly provocative and controversial theory known as the Gaia Theory (Gaia is the name the ancient Greeks gave to their Goddess of Earth).

The Gaia Theory, developed by independent British scientist James Lovelock and University of Massachusetts microbiologist Lynn Margulis, is an interdisciplinary, biosphere-oriented approach to understanding the systems of the Earth. Lovelock and Margulis view our planet as an intricately complex living system, governed by a set of self-correcting feedback loops, which for billions of years has maintained

Within the framework provided by the Gaia theory, ice ages perform an essential biological function. They rejuvenate the soils so that life can continue to flourish. Reflecting on the hundred-thousand-year glacial cycles, Lovelock has written:

"If Gaia exists, she likes it cold."





> ***The principle of this science (agrogeology) is simple: harness the natural fertilization that takes place when weathering breaks rocks into their constituent elements. Farmers could cover their fields with crushed stones rich in potassium, phosphorus and other nutrients.***
>
> **– Ward Chesworth**

favorable conditions for life on Earth. Within the framework provided by the Gaia Theory, ice ages perform an essential biological function. They rejuvenate the soils so that life can continue to flourish. Reflecting on the hundred-thousand-year glacial cycles, Lovelock has written: "If Gaia exists, she likes it cold."[3]

If ice ages are indeed a vital part of Gaia's cycles, it is difficult to avoid arriving at the uncomfortable conclusion that, barring human or divine intervention, massive extinction is a necessary part of Gaia's regenerative strategy. Norman Myers makes a sobering observation in *Gaia: An Atlas of Planet Management.* [4] He points out that ninety percent of the species that have ever lived on earth have become extinct.

These considerations raise some very interesting philosophical questions which have tangible consequences for all of us. They lead one to wonder if, for example, discussion of global climate change should remain within the exclusive domain of specially trained scientists and elected officials. Perhaps informed citizens and lay people who have unique perspectives on this problem should be invited to join the dialogue.

My personal saga, the story of a far-flung search for evidence of a connection between soil mineralization and climate change, begins here. My introduction to the Full Climate Cycle theory was in 1985, when I was executive director of the Massachusetts Office of Science and Technology, during a conference entitled "Is the Earth a Living Organism?". The conference, which was held at the Amherst campus of the University of Massachusetts, was sponsored by the National Audubon Expedition Institute and was one of the first in the nation convened to explore the Gaia Hypothesis. I presented a paper, entitled "Gaian Synergy," which attempted to demonstrate how a synthesis of the Gaia Hypothesis and Buckminster Fuller's Synergetic Geometry could reveal practical paths to sustainable economic development.

In that paper I referred to Fuller's frequent statement that humans have two options: to become conscious and constructive participants in the process of evolution, or to perish as have most of the other species that have inhabited this planet. A woman named Joanna Campe approached me after my talk and told me how much she appreciated the synthesis of ideas in my paper. She presented me with a copy of a self-published paperback entitled *The Survival of Civilization: Selected Papers of John D. Hamaker* [5] and urged me to read it. John Hamaker is the father of the Full Climate Cycle model. Although I was somewhat put off by his strident style of writing, his message hit a resonant chord within me and I integrated his theory into the paper that I had submitted to the Gaia conference. It fit into the paper well, as Joanna Campe had sensed it would when she handed me the book.

The events that followed read like a contrived plot for some New Age detective story. I was drawn into an intellectual odyssey that taught me volumes about how powerfully ideas can become entrenched, remaining so even in the face of evidence that strongly suggests they be reexamined.

> *The physicist believes that the laws of physics, plus a knowledge of the relevant boundary conditions, initial conditions and constraints, are sufficient to explain, in principle, every phenomenon in the universe.*
>
> **Paul Davies**
> *The New Physics* [6]

> *When scientists say they are seeking to establish the parameters of a problem, they are in fact seeking to establish all the macro- and microrelevant aspects of the system. Scientists attempt to solve problems on a flat piece of paper (two-dimensionally), seeking to establish their parameters with circumferential lines used like fences. Fences do not embrace flying birds. Systems – and ergo system parameters – are inwardly-outwardly inherently omnidimensional.*
>
> **Buckminster Fuller**
> *Cosmography*[7]

My revised paper, now entitled "A Systems View of The Carbon Dioxide Problem," was accepted for presentation at the thirtieth annual meeting of the International Society for General Systems Research, which was held in Philadelphia in May of 1986. There I participated in a Climate Change workshop with Full Climate Cycle proponents Alden Miller, director of the Earth Regeneration Society; Dr. Bertrand Schultz from the Nebraska Academy of Sciences; Dr. Fred Bernard Wood of the Earth Regeneration Society; his son, Dr. Fred Bruce Wood of the U.S. Office of Technology Assessment, and Joanna Campe.

While sitting in a Philadelphia cafeteria, the other participants and I were approached by a gentleman who excitedly asked if we were the people who had held the workshop on climate change and remineralization. We confessed that we were indeed the culprits, and he introduced himself as Dr. Gernot Graefe of the Austrian Academy of Sciences.

Dr. Graefe explained that he was moved to fly to Philadelphia from Austria after receiving and reading the abstracts of our papers, which contained references to soil remineralization. He told of an accident that had occurred in the Tyrol forest in the Austrian Alps (where addressing the problem of the forest's rapid demise is a national priority). A truck laden with crushed rock from a resurfaced road had tipped over and spilled its contents on the floor of the forest, which was populated with ailing trees. Eight months later, to the utter surprise of scientists, many of the trees in the area where the rock dust had spilled had regained growth and were showing definite signs of recovery.

Dr. Graefe, who was receptive to anything that might help rejuvenate Austria's devastated forests, convinced the government to fund an effort to load pressurized tank trucks with rock dust (mixed with grape pulp from nearby vineyards for greater consistency) and spray it onto ailing trees throughout the Alps. He showed us photographs of the project and told us of his plans to design controlled research projects to investigate the role of rock dust in tree recovery. He told us that when he read the abstracts of our papers he realized that, "You had a theory with no practical application and we had the application without a theory. That is why I felt compelled to come to Philadelphia."

Buoyed by Dr. Graefe's experience, I returned home to Boston and began feverishly searching for any material that might provide further evidence to support the Full Climate Cycle model. My first find was a copy of a book by Julius Hensel entitled *Bread from Stones*, which had been published nearly one hundred years ago in 1893. While working as a miller in Germany, Hensel accidentally discovered that a mixture of ground rock and grain sprinkled over his garden produced healthy and pest-free fruits and vegetables. He then conducted a series of carefully designed experiments with what he called *steinmehl* (stone meal). The results of the trials demonstrated that crops grown with steinmehl exhibited increased yields and were richer in nutrients and more resistant to insects, fungi, disease, drought and frost than crops grown without the mixture. The soil became remarkably more water soluble and resistant to erosion wherever this ground rock was ap-

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plied. Furthermore, steinmehl-grown food appeared to significantly improve the health of animals and humans who consumed it.

Despite such encouraging results, Hensel did not succeed in attempts to interest the German government in his discoveries. At that time the chemical fertilizer industry was already firmly established and seemed to be making good on its promise to revolutionize agriculture. Consequently, German government support for research, such as Hensel's, in the field of organic agriculture had all but ceased.

Dr. Lovelock said that humans unwittingly assist Gaia's return to a perfect glacial state, to their own doom, by tearing down trees and planting grain crops all over the Earth.

About a month after reading *Bread from Stones* I came across an article in the *New York Times* that caught my attention. The headline read: "Clay Eating Proves Widespread But Reason Is Uncertain." According to the article,

> *The practice of eating dirt, usually fine clays, is so common in so many societies that it must be regarded as normal human behavior rather than an oddity... some evidence indicates that [this] consumption of soils, a practice known as geophagy, can supply minerals otherwise deficient in local diets...* [8]

The article identified Dr. Bernadette Marriott, a researcher in comparative medicine at the University of Puerto Rico, as one of the world's foremost experts on geophagy. I wondered if Dr. Marriott thought there could be a link between its practice and demineralized soils. I called her at the University and asked if she could give me some references on the subject. She said that she would be happy to do so but was curious about why I wanted them.

I paused, wondering how honest I should be with this total stranger whom I had called out of the blue. I opted to lay out the whole theory for her. "Have you got fifteen minutes?" I asked. "Sure," she replied. I proceeded to give her a rapid-fire version of the Full Climate Cycle theory, placing particular emphasis on the connection between soil and climatic change.

A few minutes of awkward silence followed this explanation. Dr. Marriott broke the silence with one word: "Fascinating." She explained that it had never occurred to her that the diet deficiencies of soil-eating humans and animals might be due to mineral-depleted soils. After further discussion and an exchange of addresses, Dr. Marriott confided that she felt there might be a possible link between the process of demineralization described by John Hamaker and the practice of eating soil.

A few weeks later, while browsing in a used book store in Boston, I came across an issue of *Geographical Review*, circa 1957, which contained an article by William A. Albrecht entitled "Soil Fertility and Biotic Geography."[9] In this article Dr. Albrecht drew attention to "... foods that fill but do not nourish." During the Second World War he had examined the medical and health records of seventy thousand U.S. Navy inductees and noticed that there was a higher incidence of tooth decay and other health problems in individuals from areas of the United States known to have poor soil conditions. Further research led him to the conclusion that crops grown in soils deficient in certain trace minerals often lack nutritional value.

Meanwhile, in January of 1986 Joanna Campe had begun publishing ***Soil Remineralization: A Network Newsletter*** from her home in Northampton, Massachusetts. Almost immediately information, anecdotes and research results on soil remineralization had started to pour in from around the world. The more we looked, the more pieces we found of the complex ecological puzzle that was taking shape. The question we kept asking was: How many pieces would we need in order to persuade the scientific community to give the Full Climate Cycle theory serious consideration?

One more critical puzzle piece was discovered in the April 1987 issue of *Technology Review*, a journal published by the Massachusetts Institute of Technology. It contained an article describing the attempts of Dr. Ward Chesworth, professor of geochemistry at the University of Guelph in Canada, to resurrect the scientific field of agrogeology. The article stated that,

> *The principle of this science is simple: harness the natural fertilization that takes place when weathering breaks rocks into their constituent elements. Farmers could cover their fields with crushed stones rich in potassium, phosphorus and other nutrients.*[10]

The article noted that agrogeology had emerged in the early nineteenth century. However, the success of artificial fertilizers killed interest in this approach until the late 1970s. Chesworth's own interest in the subject had been peaked by a comparative population study of Java and Borneo conducted by William Fyfe, a geologist at the University of Western Ontario. Fyfe had written:

> *Java is one of the most fertile places on Earth, supporting well over one thousand people per square mile. Borneo supports only twenty five people in an equivalent area. The crucial difference between the islands appears to be that Borneo's rock base is granite, while Java's is volcanic.*[11]

Chesworth had suspected that it was something in the rocks that made the land more fertile. Subsequent work in Tanzania, where he applied phosphate rich scoria to agricultural fields, had confirmed this suspicion.

Chesworth's work helped provide credibility for the practice of using crushed rock to restore the mineral balance in soils. However, evidence upholding the broader connection between soil health and initiation of ice ages was still circumstantial at best. The piece of the puzzle that could provide hard evidence of an ecological "bridge" between these phenomena was still missing.

As autumn of 1987 neared I looked forward to the October Ocean Arks International Board of Directors meeting. Dr. James Lovelock, co-author of the Gaia Theory and fellow OAI board member, would be travelling to Woods Hole to attend. On the evening following the board meeting, during dinner at the home of John and Nancy Jack Todd, I had the opportunity to discuss global climate change with him.

Dr. Lovelock was familiar with the Full Climate Cycle theory. When I asked what he thought of it he replied, "I think you're right but for the wrong reasons." He explained that, based on his models of Gaian feedback loops, he too was convinced that the end result of the current period of global climate instability will be a "humdinger of an ice age." He went on to say that he believes the climate regulation system to be "very dodgy," oscillating between glaciations and interglacial periods. "What few people recognize," he added, "is that interglacial periods such as the present one represent a Gaian fever. The planet is in a very bad way. But it will regain its health by returning to a glacial state."

When I pressed him to explain what he meant by the remark that the Full Climate Cycle theory might be right for the wrong reasons, Dr. Lovelock said that humans unwittingly assist Gaia's return to a perfect glacial state, to their own doom, by tearing down trees and planting grain crops all over the Earth. These crops are generally what he refers to as "C4" plants (wheat, rice, bamboo, sugar cane, for example), which are of recent evolutionary development and are able to grow in lower concentrations of atmospheric carbon dioxide than older "C3" plants such as trees. Lovelock mused that C4 plants may have evolved as a result of glaciation and also be contributing to future glacial periods in a climatic chicken and egg scenario.

Later that October I attended the "First North American Conference on Preparing for Climate Change" in Washington, D.C. It was convened by the Climate Institute and co-sponsored by a variety of organizations and government agencies including the National Science Foundation, the U.S. Environmental Protection Agency, the World Resources Institute, and the United Nations Environmental program. I found this conference memorable because I had the opportunity to speak with Dr. Stephen Schneider, the head of Interdisciplinary Climate Systems at the National Center for Atmospheric Research. After his talk on "The Greenhouse Effect: What We Can or Should Do About it," I mentioned my conversation with James Lovelock. I asked him if he thought it possible that Gaian negative feedback loops could counter greenhouse warming or even produce a cooling effect. Dr. Schneider confided that he felt that phenomena such as clouds and the Earth's biota functioned in a manner too complex to be accurately simulated by computer models. He felt that it was possible that they might operate as global thermostats as Lovelock had suggested.

The events of the summer of 1988 greatly contributed to a growing conviction in the scientific community that global warming was not only inevitable but had already begun. Unusually high temperatures created devastating droughts which depleted global grain stocks to their lowest levels in a decade. In North America grain harvests were reduced by about eighty four million tons, down twenty five percent from 1987. China was also hard hit. It lost close to ten percent or thirty million tons of crops to drought in some provinces and to severe flooding in others. Mexico's wheat harvest was reduced by some twenty-one percent and its soybean harvest by nearly forty-six percent.

Interestingly, the winter preceding that eventful summer was also meteorologically significant.

In January, northern Europe and the Soviet Union suffered through a prolonged period of bitterly cold weather. Temperatures of minus thirty-nine degrees Fahrenheit slowed life to a virtual standstill in many Soviet cities. Numerous shipping lanes were rendered inoperative by ice and as a result food and other critical supplies became dangerously scarce in many areas. Oil prices were driven to over nineteen dollars a barrel. Although northern Europe was hardest hit by the cold snap, the impact was staggering in areas, such as Istanbul, Athens and Abu Dhabi, that were unaccustomed to harsh winter weather. In what turned out to be the coldest January on record in the Soviet Union extreme cold accounted for nearly eighty deaths. Three hundred and fifty deaths all told were attributed to the frigid temperatures of the winter preceding the "greenhouse summer" of 1988. For whatever reasons, these events, which suggest that the climate system's response to humanity's experiment with atmospheric chemistry may be more complex than first imagined, did not receive much attention from either scientists or the media – at least not in the United States.

Dr. Bruck is renewing the call for such a conference. Bruck feels that such a gathering would provide members of the growing network of proponents of remineralization with the first opportunity to meet and begin to work towards a global soil remineralization research agenda.

Nonetheless, Alden Bryant was able to convince Dr. Alexander Borg Olivier, Ambassador and Permanent Representative of Malta to the United Nations, that it was time for the Full Climate Cycle theory to get an international hearing. Dr. Olivier was responsible for placing the subject "Conservation of Climate as Part of the Common Heritage of Mankind" on the U.N. agenda. At Alden's request he sponsored a conference on "Earth Regeneration and the Environment" which was held in the United Nations' Dag Hammarskjold Auditorium on December 9, 1988. Dr. Kenneth Watt, professor of Environmental Studies at the University of California at Davis, Alden, and I were invited to speak about the Full Climate Cycle theory. Our presentations were greeted with enthusiasm tinged with a sense of urgency, and our network expanded considerably.

A month later, Dr. Lee Klinger, an ecologist at the National Center for Atmospheric Research (NCAR) in Boulder, Colorado, wrote to Joanna Campe. He indicated that he might have discovered the link between the evolution of terrestrial systems and glacial cycles. His letter also expanded on some of the issues that James Lovelock had brought up during our discussion some months back. He wrote:

> *About two years ago I came across an unpublished manuscript by John Hamaker which summarized a considerable breadth of literature in support of his hypothesis that demineralization of the globe was bringing about a rapid and sudden ice age onset. At the time I had just formulated my own hypothesis for ice age initiation and was struck by the similarity of his work with my own ideas.*

Dr. Klinger's theory is based on his extensive field work in the Alaskan and Russian Arctic, the Pacific Northwest, the Rocky Mountains and the Appalachians.

> *The essence of the hypothesis is the holistic notion that moss-dominated, bog communities are the mature or climax stage of development of all terrestrial ecosystems. The idea of a bog climax has been previously reported for several large regions, including Russia, Great Britain, Alaska and certain parts of the tropics... I've proposed several atmosphere-biosphere feedbacks associated with widespread bog formation which would lead to global cooling and ice age initiation, creating climatic conditions well suited for*

> *peatland landscapes. (Note that my ideas have been influenced by my discussions with James Lovelock and Lynn Margulis on the Gaia Hypothesis.)*

Dr. Klinger went on to point out that:

> *Several seemingly unrelated phenomena can be, at least partly, explained by succession toward bog, including forest dieback, natural acid rain, global cooling and even mass extinctions. Strong evidence from areas of forest dieback in several regions of North America suggest that tree decline and death is due to fine root mortality induced by forest floor mosses which acidify and demineralize soils.*

According to this hypothesis,

> *The occurrence of widespread dieback in mature forests... around the world represents a natural, successional process of physically undisturbed forests, although human pollution may be accelerating the succession to an unnaturally high rate.*

Moreover, "global cooling can be initiated by the extensive replacement of forests by peatlands." He goes on to say that,

> *Short-term increases in atmospheric carbon dioxide due to the death and decay of forests could trap enough solar energy to help drive high evaporation rates. However, over the long term the slow accumulation of organic carbon in peatlands would lower atmospheric carbon dioxide and further promote cooling.*

Dr. Klinger concludes that one possible way to arrest this process would be to inoculate the soils with crushed rock to neutralize acidity and enhance fertility.

> *Mosses are adversely affected by conditions of high alkalinity, especially where levels of calcium are high. Thus mineralization of forests with rock dust may indirectly benefit trees by killing mosses.*

Dr. Robert Bruck, professor of plant pathology at North Carolina State University, is an expert on the effects of acid precipitation on forest growth. His work on Mount Mitchell in the southern Appalachians suggests that trees also benefit directly from rock dust. In one experiment, conducted in April of 1991, twenty-one volunteers and graduate students working under the direction of Dr. Bruck planted six thousand red spruce and Fraser fir seedlings in experimental plots on Mount Mitchell. One half of the plots were treated with one hundred and seventy-five pounds per acre of a commercial rock dust called Planters II. Twelve weeks after the dust was applied, red spruce in treated plots had grown twenty-seven percent more in height than controls in untreated plots. Height growth of Fraser firs was nineteen percent greater in treated areas.

Back in 1990, while serving as the executive director of the New Alchemy Institute, I worked with Joanna Campe and others to organize an international conference on "Trace Mineral Restoration of Soils." Everyone mentioned in this article was asked to participate. Virtually all agreed to do so. Unfortunately, last minute funding and logistical glitches stalled the effort in the final stages of implementation. However, spurred by the encouraging results of his work on Mount Mitchell, Dr. Bruck is renewing the call for such a conference. Bruck feels that such a gathering would provide members of the growing network of proponents of remineralization with the first opportunity to meet and begin to work towards a global soil remineralization research agenda. Joanna Campe and I agree, and are committed to pursuing that goal in the coming months.

Footnotes

[1] Gifford Miller & Anne de Vernal, 1992. "Will Greenhouse Warming Lead to Northern Hemisphere Ice-Sheet Growth?" *Nature.*

[2] Daniel Botkin, 1990. *Discordant Harmonies: A New Ecology for the Twenty-First Century.* Oxford University Press.

[3] James Lovelock, 1988. *The Ages of Gaia: A Biography of Our Living Earth.* W.W. Norton and Co.

[4] Norman Myers, 1984. *Gaia: An Atlas of Planet Management.* Garden City, NY: Anchor Doubleday

[5] John Hamaker and Don Weaver, 1982. *The Survival of Civilization.* Hamaker-Weaver Publications.

[6] Paul Davies, ed. 1989. *The New Physics.* Cambridge University Press.

[7] Buckminster Fuller, 1992. *Cosmography.* New York: MacMillan.

[8] 1986. "Clay Eating Proves Widespread but Reason is Uncertain." *The New York Times,* July 22.

[9] William A. Albrecht, 1957. "Soil Fertility and Biotic Geography." *Geographical Review.* January (pp. 86-105).

[10] Stephen Strauss, 1987. "Fertilizing with Rocks," *MIT Technology Review.* April.

[11] Strauss, 1987.

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In their June 1992 publication, "Reducing Uncertainties", the International Geosphere-Biosphere Project (coordinated by ICSU, the International Council of Scientific Unions) says they are trying "to reconstruct a history of climatic and environmental change through a full glacial cycle, in order to improve our understanding of the natural processes that invoke global climatic changes....These studies will improve our understanding of the dynamic processes causing the onset, maintenance and end of glacial conditions." (p. 29) Many of the scientists involved have of course received information and communications regarding the Hamaker Thesis, and their general unwillingness to engage in even basic civilized response and dialogue gives further indication that "mum" is the word in "high-level" science circles.

However, the publishing by glaciologist Gifford Miller and geologist Anne de Vernal of their study, "Will greenhouse warming lead to Northern Hemisphere ice-sheet growth" (*Nature*, Vol. 355, 16 January 1992) may mean that the "mum" policy has outlived its uselessness or counterproductivity to the chance for Earth Regeneration. Especially since so many other publications have reported on their work, such as the articles in the *New York Times* ("Warming Up for the Next Ice Age", 1/21/92), Boston Globe ("Greenhouse effect cold increase snow: researchers", 1/21/92), *Detroit Free Press* ("A surprise twist: Global warming could lead to new Ice Age", 1/21/92) and probably hundreds of other papers via the *New York Times* News Service, Knight-Ridder Newspapers, etc. In addition, major magazines took up the story, including *Science News* (from "Fire Comes Ice", 2/8/92), *Discover* ("Cold Comfort", Aug. 1992) and with perhaps the most global distribution, *Newsweek* ("Return of the Glaciers", 11/23/92). The latter is especially important in acknowledging something of the Hamaker Thesis and pointing out how the work of those such as Miller and de Vernal supports it.

To quote author Greg Easterbrook, "A few years ago Miller began to find evidence that the glacial regions had, in fact grown slightly warmer before the last deep freeze; he learned that Anne de Vernal of the University of Quebec at Montreal was coming to the same conclusion, roughly the same one Hamaker had reached. Increased snowfall might cause glaciers to grow to the point at which their own frigid masses would cancel out the mild warming that triggered the growth, setting in motion some very bad news. 'That glaciers are cold does not mean they are triggered by cold,' de Vernal says. 'People tend to ignore the role of precipitation in ice-sheet growth. In some ways it's more important than temperature.'" And Hamaker is actually given the opportunity to convey a few words carrying his basic message for humanity in the second to last paragraph: "That is cold comfort. Hamaker, for his part, sees no reason to wait for disaster to strike. 'We've already got the warning signs of advancing glaciation,' he says. 'The only hope is to remineralize now, before the cold becomes irreversible.'" Rather than quote any more of the article here I'll encourage you to read it. I will quote the last paragraph of the original "Will Greenhouse Warming Lead to Northern Hemisphere Ice-sheet Growth?":

> *The geological record shows that conditions most conducive for initial ice sheet growth are (1) 'warm' oceanic surface waters during winter, (2) strong meridional atmospheric-oceanic circulation, and (3) low summer air temperature. The predicted change in the global ocean-atmosphere climate system caused by greenhouse warming, coupled with the decreasing incident solar radiation during summer at high northern latitudes, pushes the Earth closer to the conditions that led to the last episode of continental glaciation. Consequently, the possibility that increased concentrations of greenhouse gases in the atmosphere might lead to ice-*

Don Weaver is co-author with John Hamaker of *The Survival of Civilization* and produces the *Solar or Ice Age? Bulletin* which comes out periodically.

> *sheet growth and a concomitant sea level fall (of up to 7 mm/yr) cannot be lightly dismissed.*

Co-author Gifford Miller had received *The Survival of Civilization* and many related materials over the years.

Another very relevant article appeared in the Nov. 1991 issue of *Geology*, the cover of which reads: "Global warming, glaciers forming?". This refers to its Special Report titled "Advance of East Antarctic outlet glaciers during the Hypsithermal: Implications for the volume state of the Antarctic ice sheet under global warming," by authors Domack, Jull and Nakao. Their Abstract concludes:

> *Temperature-accumulation relations for the Antarctic indicate that warming will cause a significant increase in accumulation rather than in ablation. Models that predict a positive mass balance (growth) of the Antarctic ice sheet under global warming are supported by the mid-Holocene data presented herein....Our results suggest strongly that the response of the Antarctic glacial system to future warming would be an increase in mass balance.*

This article, too, was widely publicized, as in *U.S. Water News*' April 1992 editorial which said,

> *The George C. Marshall Institute reports that in 1980, experts were concerned global warming would melt the polar ice sheets and cause sea levels to rise 15 to 25 feet. In 1985 that prediction became 3 feet, and by 1989 just 1 foot. A major study in the journal* Geology *recently blew another hole in the failing global warming armor by reporting research that could show sea levels would actually fall if global warming were to occur....but the George C. Marshall Institute study of the evidence for global warming suggests that if there is more water vapor in the atmosphere, there will be more clouds. And if there are more clouds, they will block the sunlight, causing a cooling effect of the Earth rather than a warming one.*

And interestingly enough, strongly "conservative" columnist Warren Brookes, who wrote a batch of columns attacking the global warming "alarmists", also comments on the *Geology* report in his last column for the *Detroit News* (12/19/91) and added to the support for reconsidering the Hamaker Thesis, which to my knowledge he never directly addressed. His column was entitled "Global warming models get iced".

Warren Brookes died on December 28, 1991 at age 62, "following a brief illness." Here is a quote from his final column:

> *The same week of the NOAA report, a major study in the journal* Geology *blew away the other common thesis of the global warming gurus such as Steve Schneider, who warned in his book* Global Warming, *'Sea level rise is undoubtedly the most dramatic and visible effect of global warming in the greenhouse century.' He once hinted at a 30-foot rise. Last year the American Geophysical Union lowered that to 9 inches, plus or minus 18 inches!*
>
> *It was good they put that 'minus' in there, because in the Geology special report, the three marine sediment scientists found that during the very warm mid-Holocene period (4000 to 7000 years ago) the Antarctic ice sheet* expanded *substantially. 'This event took place in a climate that was a few degrees warmer than present. Therefore the mid-Holocene period might be a good temporal analogy for the kind of climatic conditions expected during global warming.'*

The *Geology* report was also briefly noted under "Greenhouse Ice" in the internationally syndicated newspaper report called "*Earthweek*: A diary of the planet", which is also recommended to those wanting to keep up with "local" planetary events.

Also in November, 1991, an additional study confirming Antarctic snow and ice buildup, "Evidence from Antarctic ice cores for recent increases in snow accumulation", was published in *Nature* (Vol. 354, 7 November 1991). A key quote from the abstract:

> *We (four Australian authors) find a significant increase in the accumulation rate following a minimum around 1960, leading to recent rates that are about 20% above the long-term mean. If this recent increase is widespread [they studied a 700 km segment of East Antarctica], as suggested by shorter-term accumulation data from across a large part of Antarctica, the positive imbalance (5-25% of the mass input) shown in recent studies of the ice sheet's mass budget may have existed only since the late 1960s. We estimate that this increase in accumulation rate should contribute to a lowering of sea level of 1.0-1.2 mm per year.*

'People tend to ignore the role of precipitation in ice-sheet growth. In some ways it's more important than temperature.'

–Anne de Vernal

I don't see anything in their article addressing the possibility of an accelerating rate of accumulation....

The 1992 *Old Farmer's Almanac* includes an article on "The State of the Earth: 1992", which says (p. 284),

> *The coming ice age is probably more dangerous than the greenhouse warming because, although the latter can temporarily warm our tropical latitudes, it also will suck up moisture that gets blown by the wind to the poles; there it will descend as heavy snow to thicken the ice that cools the polar oceans and advances glaciers and deserts throughout the temperate zones. Twenty-five ice ages have already been studied. They last about 100,000 years separated by much shorter interglacial periods. The long-range trend is toward cooling.*

Going back a little further is an article I don't think was noted in previous issues of ***Remineralize the Earth***: "Geese in the Global Greenhouse" in *Discover* magazine, April 1990. In referring to the northward migration of hundreds of thousands of snow geese in spring:

> *Robert Jefferies, a botanist at the University of Toronto, has found that for most of the past decade heavy snowfall and sun-obscuring cloud cover have conspired to delay the Canadian snowmelt and interrupt the birds' migration. In the 1980s, Jefferies says, the snow line was 90 to 150 miles south of where it was in the 1970s on May 15, which typically marks the start of the nesting season. As a result, when the geese arrive, the northern shores of the bay are still under snow. Immense gaggles of geese accumulate at its southern shores and remain trapped there for up to several weeks.... Jefferies notes that some computer models of the greenhouse effect for Canada suggest that dense cloud cover will continue to delay the springtime snowmelt. [Computer models seem to be getting more realistic.] 'We can't say for certain that what we've seen this past decade is a direct result of the greenhouse effect,' Jefferies says. 'But if it is, then it suggests that some consequences would be so indirect that we could never begin to predict them all.'*

One other newspaper article commenting on the apparent "installation" of the "global warming" idea should be quoted in part here. It is by Patrick Michaels, environmental sciences professor at the University of Virginia, and is titled, "Warming craze 'even worse than we thought':

> *...Scientists have suspected something was wrong with a straightforward greenhouse warming for about three decades. As early as 1965, climatologist Reid Bryson at the University of Wisconsin lectured that other emissions that go into the air along with carbon dioxide, such as sulfate aerosol, were interfering with warming. ...Bryson's hypothesis suggested that cloudiness should be increasing, cooling the days and warming the nights, but certainly the mix of human insults to the atmosphere didn't necessarily add up to dramatic warming. No prominent atmospheric scientist has probably suffered more from bad timing. Bryson's results were published just as the global warming craze hit with a vengeance. Early General Circulation Climate Models (GCMs) had just come out, predicting gloom and doom. Within a few years, GCMs were in command. Disregarding the GCMs' apparent proclivity to produce apocalyptic results in the face of the observed data [generally looking only at average temperatures – D.W.], the Carter administration had already started to hold extensive meetings on what to do about global warming. A 1979 meeting in Annapolis, sponsored by the Dept. of Energy, was replete with sociological and psychological impact panels, a sure sign of approval inside Washington's Beltway. Participants were told that there would be no questioning of the GCMs, which were the scientific centerpiece. Politics, in the form of money and policy, had begun to impede the normal process of checks and balances between observations (data) and hypothesis (GCMs). The small, virtually unfunded community which was already saying that something had to be wrong with the models was silenced by the biggest cash cow in the history of my profession: prediction of apocalypse.* Detroit New 6/22/92

Many more articles have appeared in your own local newspapers, and I'd again encourage everyone to be an alert student of weather, climate and ecology so we might be of more help to each other and the Earth in this most important decade.

CLIMATE RESOURCES LIST

Sources on climate and global change research, news, and views – with the usual lingering bias toward "global warming" – are these free-to-serious -researchers publications:

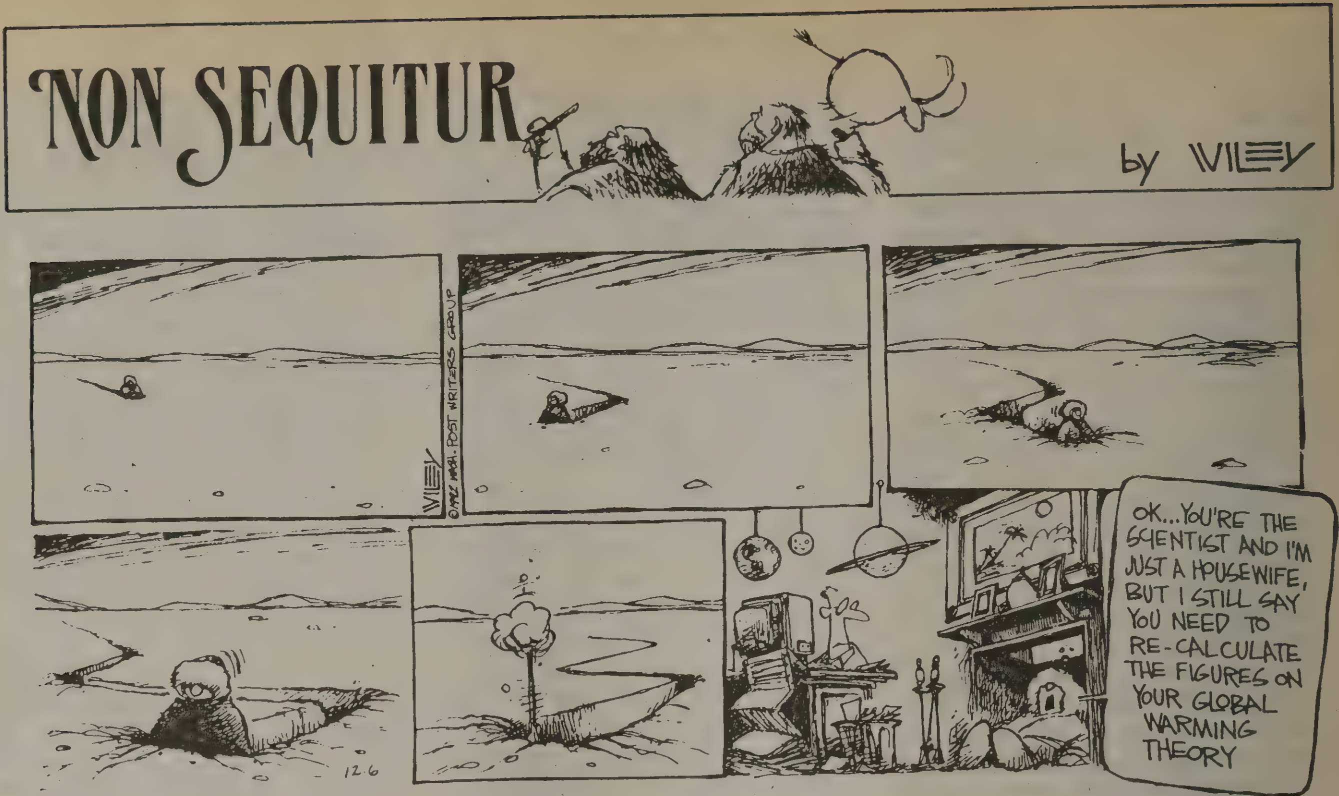
Network Newsletter (of the
Climate-Related Impacts
International Network)
c/o Maria Krenz
NCAR/ESIG
POB 3000
Boulder, CO 80307

EarthQuest
Office for Interdisciplinary
Earth Studies (OIES)
University Corporation for
Atmospheric Research (UCAR)
POB 3000
Boulder, CO 80307-3000

Global Change Newsletter
(of the International
Geosphere-Biosphere Program)
IGBP Secretariat
The Royal Swedish Academy
of Sciences
Box 5005
S-104 05 Stockholm, Sweden

I'd encourage everyone who wants to be better and more regularly informed on this subject to get on the mailing list to receive the ***Weekly Climate Bulletin*** from:

Climate Analysis Center,
W/NMC53
Attn: **Weekly Climate Bulletin**
NOAA, Nat'l Weather Service
Washington, DC 20233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12-6
OK...YOU'RE THE SCIENTIST AND I'M JUST A HOUSEWIFE, BUT I STILL SAY YOU NEED TO RE-CALCULATE THE FIGURES ON YOUR GLOBAL WARMING THEORY

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In North America

1. The 8/10/91 issue of *Weekly Climate Bulletin* shows a 1953-1991 tornado total chart for the January-July period, and 1991 looks to be another record-shattering year if the preliminary holds: "The January-July preliminary total of 1,181 is a record and well above the previous record of 940 set in 1990."

2. "*Winter drops in 6 weeks early* – Record low temperatures. Snow measured in feet that is piled into waist-deep drifts by razor-edged, gusty wind. Ice-encrusted roads that look like lunar landscapes and feel as rough as cobblestones. But it's still autumn, pre-Thanksgiving. The first day of winter is still six weeks away....The blizzard, dubbed a 'megastorm' by the National Weather Service, dumped more than a foot of snow a week ago in parts of North Dakota, more than 2 feet in the Twin Cities of Minneapolis and St. Paul, and 3 feet at Duluth. So much snow has never fallen that early in the season since record-keeping started....Some farmers will have to wait until spring to get into the fields to harvest the last of their crop – or lose it altogether. County extension agents in North-Central Minnesota say up to 40 percent of the corn crop was still in the fields when the blizzard hit. Wildlife experts say many of Minnesota's estimated one million whitetail deer may starve." *Johnson City Press*, 11/9/91

3. "*Grain Supplies Tight, Prices May Soar* – U.S. supplies of wheat and corn are shrinking, the government reported yesterday, and analysts predicted sharp increases in prices farmers receive for their grain and possibly in bread prices. The Agriculture Department said in a monthly report that U.S. wheat supplies before the next harvest in early summer should drop to 390 million bushels, down 24 million from the December estimate. Analysts said that would be the lowest level since 1973-74, and an extremely small amount given fairly strong demand for U.S. wheat domestically and overseas." *San Francisco Chronicle*, 1/14/92

4. "A series of strong Pacific storms pounded California, dumping up to 15 inches of rain in southern California and nearly 7 feet of snow in the mountains. These torrential rains generated some of the worst flooding in 50 years across parts of southern California....Ironically, the heavy rains provided only limited relief from the long-term drought since the majority of the rain and snow fell south of the state's major reservoirs or was swept into the Pacific Ocean as runoff." *Weekly Climate Bulletin*, 2/15/92

5. "In sharp contrast, Arctic air settled across the northern tier of states from the Dakotas eastward, producing a dozen record lows as readings plunged to near zero. ...In Alaska, bitterly cold conditions gripped interior sections early in the week. The mercury sank to -23° F at Fairbanks, AK on Monday, setting a record for the lowest reading so late in the season." *Weekly Climate Bulletin* 4/18/92

6. "*Hail Damage in Texas May Set a Record* – The damage from last week's hailstorm that rained ice chunks the size of baseballs may set a national record, with

In Eurasia

1. *"Drought* – Following a disastrous summer of record flooding, one-eighth of China is now suffering from a drought that is taking a huge toll on the winter grain crop. The *China Daily* newspaper reported that many parts of at least 10 provinces have had little or no rainfall for the past three months." *San Francisco Chronicle*, 11/30/91

2. *"China Issues Report On Natural Disasters* – Disasters in China killed more than 7,300 people and caused $22 billion in damage last year, according to an official report seen in Beijing yesterday. Floods were responsible for the deaths of 5,113 people and resulted in $14 billion in losses...." *San Francisco Chronicle*, 4/3/92

3. *"Frost* – A late-season cold snap brought on by an outbreak of Siberian air damaged crops in northeastern China's Heilongjiang Province. More than 500,000 acres of farmland and 24 cities were affected by the June frost, according to the official Xinhua news agency." *San Francisco Chronicle*, 6/20/92

4. *"Six-week drought ruining Polish grain crops* – 'Perhaps it is the drought of the century; certainly it is the biggest drought in the last few decades,' Franciszek Blok, a director at the Agriculture Ministry, said Tuesday. The drought is also hurting agriculture in neighboring Lithuania and causing forest fires in another Baltic country, Latvia." *San Mateo Times*, 7/15/92

5. *"Poland Fights Hundreds of Forest Fires* – Thousands of weary firefighters struggled yesterday to control the worst Polish forest blazes in decades, and drought-parched woodlands from Russia to Greece also erupted in flames. ...In Belarus, hit by the worst dry spell in a century, fires have kicked up radioactive dust and ash left by the 1986 Chernobyl nuclear explosion, threatening people and livestock." (Not to mention wildlife of all kinds.) *San Francisco Chronicle*, 8/12/92

6. Benton Dere, a local gardener with roots in China, told me on 9/12/92 that relatives in China said Peking had its first August snow ever.

7. *"Drought* – Croatia, already struggling to cope with the economic devastation caused by its bloody separation from Yugoslavia and the demands of a massive influx of refugees, is now facing drought. In the Slavonia region, the breadbasket of Yugoslavia, corn production is estimated to have fallen by 40 percent. In the Adriatic coastal Dalmatia region, drought has destroyed 63 percent of the peach crop and 30 percent

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estimates ranging up to $600 million, insurance industry officials said. 'This is undoubtedly the largest financial loss of any (hail)storm because it was so widespread,' said Al Clark, a State Farm Insurance representative in southwest Arlington, one of the hardest hit areas during last week's hailstorm. 'You're talking about 17,000 houses getting hit just in Arlington alone,' he said.... 'I'm being told that the damage will end up being greater than the storm out in Colorado.' In July 1990, hail caused more than $600 million in damage to metropolitan Denver and was the costliest hailstorm in history." *San Francisco Chronicle*, 5/4/92.

7. *"Drought may set stage for wildfires* – A sixth year of drought means the forest itself is dying. In some places around the Lake Tahoe Basin, 60 percent of the white fir trees stand dead. And weakened Jeffrey pines increasingly fall victim to beetles and other forest insects. 'It's like a piece of dynamite ready to be matched,' said March (Of Sierra Front Wildfire Cooperators).... From Modoc County to San Diego, drought continues to take its toll on the trees ...A major fire in the Tahoe Basin puts at risk nearly $6 billion in property values – 20,000 resident housing units, 10,000 vacation homes or condos and nearly 10,000 hotel and motel units." *San Mateo Times*, 5/11/92

8. "Severe weather battered the nation's midsection as strong thunderstorms spawned tornadoes, hail, high winds and heavy rain from southern Texas northward to the upper Mississippi Valley....Alaska's weather began to improve by mid-week after the record late-season snowfall closed two major highways." *Weekly Climate Bulletin*, 5/16/92

9. *"Late Chill* – A late-spring cold snap put a shiver through farmers in the Canadian Prairies and American Midwest, but agronomists are confident that most crops were not harmed by the record-breaking cold temperatures. In Kansas, farmers were worried about their winter wheat crop, corn and soybeans after overnight lows dipped to as low as 24 degrees." *San Francisco Chronicle*, 5/30/92

10. "The first week of astronomical summer featured torrential rains across parts of Florida, unseasonably cold weather across much of the eastern half of the nation, record heat in the Pacific Northwest and violent thunderstorms in the southern Plains. ...Behind the frontal system, an unusually cold blast of Canadian air spilled into the upper Midwest and Great Lakes and eventually into the southern and eastern U.S. Lows dipped below freezing at Duluth, MN." *Weekly Climate Bulletin* 6/27/92

11. *"Fire Threat in West is the Worst in Years* – The normally wet Pacific Northwest received only a trace of snow in the mountains this past winter, leaving the heavily-forested slopes of the Cascade Mountains bone-dry by early June. Temperatures above 100 degrees last month have dried out mountain streams and drained moisture from all but the highest of alpine forests. Compounding the problem is a severe bug infestation in the National Forests of Idaho, Montana, Oregon and Washington. Bark beetles, spruce

of the grape harvest." *San Francisco Chronicle*, 9/12/92

8. "Flooding leaves Pakistan reeling – So far, more than 2,000 Pakistanis have perished in what the government has called the worst flooding in Pakistan's 45-year history. Three days of heavy rain last week also flooded parts of India, killing more than 500 people... In Pakistan, 2,900 villages have been flooded and much of the country's richest farmland has been devastated. Agriculture experts claim that most of Pakistan's cotton crop, which provides 50 percent of the nation's export earnings, was destroyed by flood waters." [Not to mention food crops.] *San Francisco Chronicle*, 9/18/92

9. "*Moscow gets earliest snowfall in 16 years* – Temperatures fell to 19° F. overnight.... Wednesday's forecast was not much better, with temperatures expected to plunge as low as 9° F." *San Mateo Times*, 10/13/92

10. "Drought – In contrast to the flooding just a few hundred miles to the southwest, Bulgaria's Ruse river, a section of the Danube, fell to its lowest level in 114 years because of the severe drought affecting parts of northern and eastern Europe. The drought has also delayed Russia's harvest – the entire cereal harvest may fail in some regions. The continuing drought across most of southern Africa has now brought about 20 million people – about a fifth of the population – close to starvation. Villagers in some places eat mud to stave off hunger pains after months of surviving on leaves and roots that have now run out." In this same *Earthweek* diary is 'Other Victims': "Starving baboons have begun eating goats in Zimbabwe's drought-hit Masvingo province, the local Ziana news agency reported. 'Goats and baboons are known to coexist in peace, but the drought has changed all that,' said Zaka district council chairman Callisto Watadza. The baboons attack the goats in troops and eat virtually the entire animal. So far, more than 300 goats have been devoured. Baboons usually eat wild fruit, grasses, roots, leaves and grain, as well as insects and small reptiles. The worst drought this century has stripped the land of all vegetation." *San Francisco Chronicle*, 10/10/92

11. "*Mongolian Snow* – the official Chinese Xinhua news agency reported that six heavy snow-
nomic Associates of Vancouver, Washington." *San Francisco Chronicle*, 7/23/92

15. "*Record Cold Summer* – This has been the coldest summer on

In North America

budworms and tussock moths have defoliated up to three million acres of timber in the arid forest east of the Cascades....A severe drought, now in its sixth year, throughout much of the West has weakened the trees, providing optimal conditions for the insects. 'It's about as dry now as anybody has ever seen it,' said Arnold Hartigan, a spokesman for the Boise Interagency Fire Center in Idaho, which coordinates firefighting throughout the West. 'We are in absolute, extreme drought conditions.' California has another 10 million acres of dead trees...." *New York Times*, 7/6/92

12. "*Canadians chilling out in '92 – From Prairies to Newfoundland, summer's a dud*....In Ontario, the first day of summer was the coldest on record and it has been cold and wet ever since. ...Where it has been warm in the far West, however, it has been really warm. Vancouver area municipalities have curbed lawn watering to try to conserve shrinking reservoirs. There have been almost 1,400 forest fires reported in British Columbia, about twice the number at this time last year. Across the rest of the country, the question is: 'Whatever happened to global warming?'" *Toronto Globe & Mail*, 7/15/92

13. "*Ontario farmers dread early frost* – An early frost in September could be disastrous to Ontario farmers, who are relying on some warm weather and sunshine to get their crops growing. 'It just doesn't grow,' said Ed Pattyn, a Simcoe County vegetable farmer. 'This time of year it should be 18° (C.) at night, not this 11° temperature we've been getting.' The cold temperatures and rain that have dominated weather from Newfoundland to Alberta this summer are bad news to a lot of Southern and Central Ontario farmers, who have seen their crops stagnate in the fields for weeks." *Toronto Globe & Mail*, 7/18/92

14. "*Growers Add Up the Drought Damage* – New evidence shows that agriculture in the San Joaquin Valley (alone) suffered much more drought damage last year than previously thought. The total loss to growers was set at $444 million by Northwest Eco-

record in many locations across the American Great Plains, Canadian prairies and Great Lakes. Since June, cool and rainy weather has been the rule across the region." *San Francisco Chronicle*, 8/8/92

16. "*Ontario's weather takes toll on crops* – The hailstorm lasted less than 90 seconds but that was long enough to wipe out Ed Epp and his $2 million peach crop. ...The hailstorm was the culmination of two months of bizarre weather that has been a disaster for Ontario farmers. July was the coldest month in 109 years, the cloudiest since 1915 and the second wettest since the 1930s. So far, August has been little better. For farmers, it means $2 billion worth of Ontario crops are two weeks behind schedule; tomatoes are green on the vine, beans are beginning to rot and corn may not have time to ripen." *Toronto Globe & Mail*, 8/17/92

17. "*Alberta weather turns flaky* – The suntans and calendar may tell us it's summer, but snow in parts of western Alberta yesterday morning said winter. Residents north of Edmonton woke up

storms have imperiled 54,000 herdsmen and more than 7 million head of livestock in the Inner Mongolia Autonomous Region. The report said that the snow was three to four times deeper than in previous years, and was covering pastures needed by the livestock to survive." *San Francisco Chronicle*, 10/19/92

12. "*Winter* – Scores of people died as a result of a deep Siberian chill that affected much of Europe. ...Even the Mediterranean island of Sicily was covered with snow for the first time in a quarter of a century. Poland's coldest weather in decades burst pipes in more than 200 residential buildings.... Despite the severe winter conditions in northern Bosnia, fighting in the former Yugoslav republic barely abated. The deepening winter chill took more lives in Sarajevo, where fuel supplies are nearly exhausted." *San Francisco Chronicle*, 1/9/93

In the Middle East

1. "*Heavy snow, rain hit Middle East* – Politicians were driven to Parliament in army jeeps and police vans Thursday as a rare blizzard blocked roads and shut businesses in Jerusalem. In the occupied lands, some Palestinian protesters switched from throwing stones to snowballs....Jordan's snow was the worst in 68 years, while Israel's storms were judged overall to be the worst since it became a state in 1948. About 18 inches of snow fell on Jerusalem Wednesday night and Thursday, capping the steeples of Christian, Jewish and Muslim shrines." *Johnson City Press*, 1/2/92

2. "The Winter of 1991-92 will go down as one of the most brutal on record throughout northern Africa, extreme southwest Asia and the Middle East. The dominant upper-level flow pattern has forced both frigid Siberian air and moist sub-tropical air into the region, generating exceptionally cold and wet weather. Accumulating snows, which are quite unusual across much of the region, have repeatedly paralyzed a number of Middle Eastern cities, including Damascus, Jerusalem, Amman and Beirut, with the latter city observing the first accumulating snow in forty years. Last week, as much as a foot of snow buried Athens, Greece, while farther west, rare snows afflicted portions of Portugal and the Madrid, Spain vicinity." *Weekly Climate Bulletin*, 2/22/92

3. "*Snow socks it to Israel* – In northern Israel, many villages were completely cut off by the storm and Israeli radio said the region is an agricultural disaster

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to about five centimetres of snow on the ground." *Toronto Globe & Mail*, 8/22/92

18. "*Summer Snow* – Cold Arctic winds swept into the Canadian province of Alberta and the state of Montana with temperatures as low as 35° F. The cold and snow may have destroyed 90 percent of the wheat and barley crops in Alberta, which caused commodity prices to rise. One foot of snow fell on some parts of Montana and closed several major highways. Heavy, wet snow bent crops and snapped tree branches in the provincial capital of Edmonton." *San Francisco Chronicle*, 8/29/92

19. "Slow-moving thunderstorms dumped torrential rain across southern Iowa, southeastern Minnesota and southwestern Wisconsin, washing out roads and bridges, submerging cropland and cutting off entire communities. On Monday and Tuesday, powerful thunderstorms developed south of a stationary front extending across the middle Missouri Valley into the upper Great Lakes, inundating nearly 3,800 square miles of southern Iowa with heavy rain and forcing many residents from their homes. Measurements of 6 and 10 inches of rain in 24 hours were common, with Van Wert in south-central Iowa reporting an unofficial 16 inches. Extensive damage to corn and soybeans that had been expected to produce near-record yields were reported....In Alaska, early season storms dumped heavy snow across central and southeastern portions of the state. Gulkana was blanketed with a foot of snow, a record total for the month of September....In Alaska, abnormally cold conditions persisted, with weekly departures as low as -16° F in central portions of the state. *Weekly Climate Bulletin*, 9/19/92

20. "Drought Approaches Dust Bowl Records – Unless the heavens deliver a good strong dousing this winter, Northern California could find itself gripped by the worst drought in more than 400 years, state water experts said yesterday." *Weekly Climate Bulletin*, 11/4/92

21. "October opened with the earliest snow on record in St. Johnsbury and Burlington, Vermont, and snow also blanketed parts of Colorado, Wyoming, Nebraska and South Dakota. Frequent blasts of Arctic air plunged into the nation's midsection while the Southwest baked in summer-like heat." (from Fall summary in *Weekly Climate Bulletin*, 12/12/92

22. "Christmas brought notes from friends and relatives in MI, MN and IN. All said the same thing – really, no summer to speak of, short growing season, farmers only now that the ground is frozen can get into the fields to harvest the corn – too wet up until the freeze, and endless, endless days this fall of nothing but clouds and more clouds. The same is true here. Don't know when there have been so many months when the sun has not come out." (late 12/92 letter from Anita Hamaker, Seymour, MO)

23. "While generally gloomy conditions were observed over the eastern two-thirds of the country, most were not as unfortunate as Des Moines, Iowa, which set a record for the least hours of sunshine in a month. Out of a possible 300 hours, only a paltry 57 hours of sunshine was observed during

area....The border town of Metulla, which was plagued by a rain of Katyusha rockets fired from Lebanon by Shiite Muslim guerrillas last week, was buried under four feet of snow, making further hostilities impossible." *Montreal Gazette*, 2/26/92

4. "*Mideast Winter* – The season's fifth chilling snowstorm to sweep across the eastern Mediterranean brought Athens to a standstill under a thick blanket of snow, and paralyzed parts of Syria, Jordan, Lebanon and Israel. In Jordan, snow was reported to be nine feet deep in some areas, and three feet deep in the capital, Amman. It was the worst blizzard to hit the country since 1927." *San Francisco Chronicle*, 2/29/92 [Unusually cold weather finally turned to just "cold pockets" after 20 weeks, according to the 4/11/92 *Weekly Climate Bulletin*.]

5. "*Winter Woes* – The Middle East braced for another unusually harsh winter as snow fell on Jerusalem and Amman and heavy rain lashed Lebanon. Rain and floods along the Beirut-Tripoli highway caused a Syrian tour bus to overturn, killing five people. In Ammam, the first snowfall was accompanied by gales and freezing temperatures." *San Francisco Chronicle*, 12/19/92

In Africa

1. "Drought brings hunger and misery – More than half the population of southern Africa – from Angola in the west to Mozambique in the east – is on the brink of starvation. The international Committee of the Red Cross (ICRC), which is coordinating relief work in the region, has figures which show that 18.1 million people in 10 countries – excluding South Africa – are now dependent on food aid....In South Africa, Operation Hunger alone feeds 2.2 million people, pushing the figure to more than 20 million." Johannesburg, South Africa, *The Star*, 9/23/92

In New Zealand

1. "Worst Vegetable season in years – Southland vegetable growers are experiencing their worst season in 30 years, with bad weather taking its toll on crops. Spring onions, cabbages, radishes, cauliflowers and lettuces are all weeks behind schedule, with the recent wet, cold weather halting plant growth." *Southland Times*, 11/30/91

2. "*Early winter predicted* – While the cool temperatures might be regarded by town and city dwellers as just a curiosity, they could have severe financial implications for horticulturists and farmers. 'Particularly now the frost-sensitive wine grapes are maturing, and sweet corn and maize in areas like Canterbury, as well as tomatoes,' Dr. Salinger (climatologist Jim) said. 'Normally air temperatures don't fall below zero in Canterbury until mid-April or early May, but last night we had minus three degrees in Timaru – the frosts are a full four weeks earlier.' Another example of an unseasonal frost was recorded at the start of the summer, when a frost on November 27 significantly hurt vineyards around Martinborough, he said, 'So we had a late spring frost and we're now getting early autumn frosts,' Dr. Salinger said." *Southland-Times*, 3/24/92

3. "*A Bigger Chill* – Temperatures in the Ida Valley and surrounding Maniototo have again fallen to degrees below last year's Big Chill. Last week's 'biggest chill' in the valley was a frost of minus 2 to 24° – an unofficial reading. The lowest-ever air temperature recorded by the New Zealand Meterological Office was in 1943 at Ophir – minus 19.7° C. For the month of June – not usually the coldest month – their lowest recording was in 1941 at the Manorburn Dam – minus 15.6° C." *The Mirror of New Zealand*, 6/24/92

4. "*Killing Snow* – Farmers in New Zealand's South Island suffered huge losses as severe storms brought heavy snowfall for the second time within a month. The fierce storm killed thousands of newborn lambs and many of the sheep that had survived the previous storm." *San Francisco Chronicle*, 9/6/92 [Other articles report on this being the worst storm in at least 50 years, and that damaged kiwi fruit is being shipped to help feed the sheep.]

In North America

the month. This was 12 hours less than the previous record set in December, 1971. November also saw 178 tornadoes touch down across the country.... This massive total of tornadoes is not only over 50 more than the next highest year (1988) since 1953, but is also nearly seven times the average over the past 39 years." *Ag Alert*, 12/23/92, published by California Farm Bureau.

24. "Agricultural officials warned that the impact of the storm (hurricane Andrew) on South Florida's agriculture industry, which supplies the United States and Canada with tropical fruits and winter vegetables, will probably last well into the next century." *San Francisco Chronicle*, 9/5/92

25. "*Numbers Remove All Doubt About Hurricane's Wallop* – Hurricane Andrew pushed a storm tide almost 17 feet high across Florida and caused $15 billion to $30 billion in damage, according to a National Hurricane Center report released yesterday....Hurricane Andrew is considered the costliest natural disaster in U.S. history." *San Francisco Chronicle*, 9/18/92

26. "*Hurricane Iniki, worst in a century, pounds at Kauai* – 90 percent of island's 25,000 dwellings damaged, $100-150 million crop damage, etc." *San Mateo Times*, 9/12/92 and others.

For your more reliable and ecologically studied predictions of "apocalypse" – with insight into how yet to prevent it (time permitting) by unprecedented application of minerals, intelligence and reverence for Life – I would again urge all to give John Hamaker's messages the most careful consideration. I hope this review has added to our understanding of what is happening to our climate, food supply and planet.

I wish to thank Joanna Campe for all her continuing great work with *Remineralize the Earth*, and John Hamaker for so many years of trying to warn and enlighten us.

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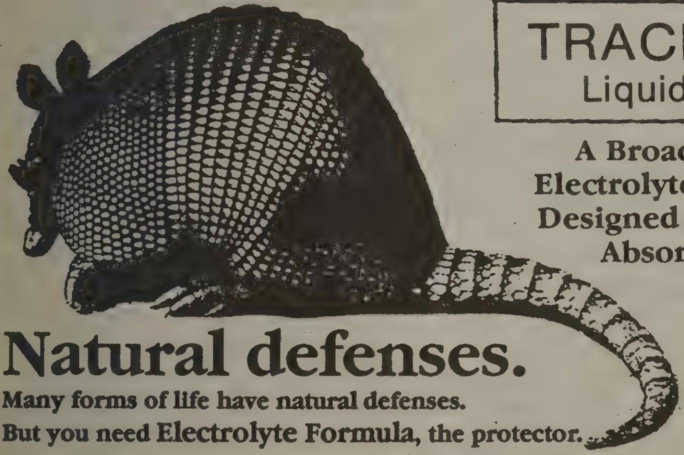

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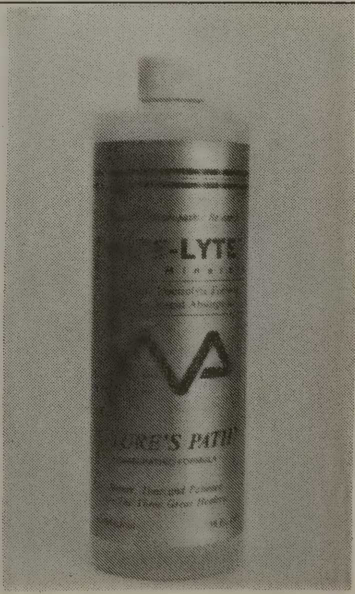

THE MISSING LINK?

A number of years ago Charles Northern, M.D., whose work with soils is quoted in government Senate document #245, was asked to explain his intense interest in soil minerals. Dr. Northern answered, "I'm an M.D., my work lies in the field of biochemistry and nutrition. I gave up medicine because this is a wider and more important work. Sick soils mean sick plants, sick animals, sick people. Physical, mental and moral fitness depends largely upon an ample supply and a proper proportion of the minerals in our foods."

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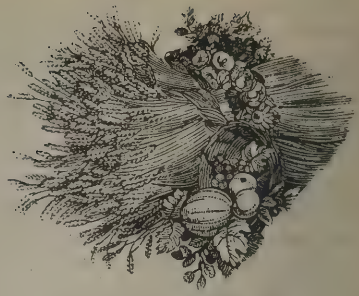


by Dr. Gerald Olarsch

> ***If we do not return those minerals to the soil as nature intended us to utilize through our food source, the rise of all degenerative diseases and cancers will proliferate beyond our wildest imaginations.***
>
> **– Dr. Earp-Thomas**

When the pilgrims first landed in America, the average level of topsoil was estimated to be three feet deep. Today it is estimated to be an average of less than six inches! What a sad commentary on the outlook for the health of future generations of Americans. I say this in all sincerity, as I read more articles and study more and more scientific publications linking the soil mineral depletion to the critical state of affairs in our country regarding health. Compounding this problem is an antiquated health care system with uncontrolled, spiraling costs, compounded again by an aging population.

Many years ago, a famous and well-respected soil scientist, Dr. Earp-Thomas, said, "If we do not return those minerals to the soil as nature intended us to utilize through our food source, the rise of all degenerative diseases and cancers will proliferate beyond our wildest imaginations." As we now know, this prophetic statement is ringing ever so true. Earp-Thomas said that without these minerals, cellular health cannot be maintained, allowing the osmotic pressure of the cell walls to decrease, and thereby allowing stray viruses, bacteria, etc. to "break into" these previously healthy cells and begin their destructive journey. Along with the weakening of the cell walls is an accompanying change of the cell pH, compounding the calamity.

Further evidence of this horrific increase of disease today is found in the work done by such noted nutritionists as Dr. Bernard Jensen, who in his many years of research and world travels noted that the Hunzas live a healthy life to the approximate age of 120 years...this being due, probably, to their ingestion of the mineral-rich mountain waters (naturally pure, with a high electrolyte mineral content), and their use of this highly mineralized water on their crops.

Additionally, the brilliant scientific work of such men as Dr. Underwood of Australia, and particularly Dr. Henry Schroeder of Dartmouth College, who wrote what many regard as the American "classic" on the subject of lack of minerals in the soil and its relationship to the declining health of humans. In his book, *The Trace Elements and Man* (Devon-Adair, 1973), Schroeder stated, "Trace elements are the nutrients man evolved on, abundant in our diets and those of our ancestors for all but the last twenty of the many millions of years it took life to evolve. In these past twenty years, food processing and high-yield farming techniques have caused depletion in the amounts of these nutrients found in our foods."

One cannot write such an article and fail to mention what I consider to be a "must" book for those truly interested in seeking a higher level of both knowledge and health, *The Survival of Civilization* by Hamaker and Weaver; from my perspective, this should be required reading in every classroom in America.

Allow me to conclude by urging those of us so inclined to seek a healthier lifestyle, whether through growing our own crops organically, or by demanding of our food suppliers truly natural and organic foods, to form a "grand coalition" of farmers, up the chain, to consumers who will not accept anything less than what Mother Nature intended us to have for a long and healthy life. Therefore, we must all become activists, vocally and in letters, particularly aimed at those legislators who allow the pollution and destruction of our Earth to continue unabated!

Lest we forget: *The longest journey begins with the first step.*

Dr. Gerald Olarsch, N.D. is President of Naturopathic Research Laboratories, Inc.

Remineralize the Earth
Offers Two New Updated Research Packets:

AGRICULTURE & FORESTRY/ SEWAGE SLUDGE TREATMENT PACKETS

> As Ward Chesworth and co-researchers write in their article, "Agricultural Alchemy: Stones into Bread:"
>
> *Our most optimistic expectations are no less than the realization of an old dream: 'What will fertilizing with stone dust accomplish? It will turn stones into bread... make barren regions (fruitful) (and) feed the hungry'.* – Julius Hensel, *Bread From Stones* (1894)

These two new updated packets are a great resource for networking to academics, scientists, policy makers, government and for mounting a remineralization campaign in your area. They are of a much higher quality than the research packets we were able to offer in the past. They leave no doubt about the value of SR from a technical scientific perspective.

One thing is getting great results in your garden and another is to convince those at your local college, university, state officials, the Dept. of Agriculture, the Forest Service, and so on. These studies will furnish enough data and evidence to encourage researchers to pursue studies within the U.S.

This collection of studies comprises almost 250 pages with impressive photos. They include studies that have been retranslated by Christian Campe and newer ones just recently translated.

Remineralization has been researched and explored mainly by three different groups:

First, German nutritional biochemist Julius Hensel pioneered remineralization in the 1880s with his book *Bread from Stones* and a modest agricultural movement came into being. Following his contribution, many scientists have done research on remineralization since the late 1930s in Germany and Central Europe for agriculture and forests.

Second, is a more recent development called *agrogeology* and this research has been carried out mainly in Canada, Brazil, Tanzania, the Canary Islands, and West Africa – especially on laterite soils. Because of the intense tropical rainfall, NPK fertilizers are washed out in only a few weeks and cannot be stored by the soils, and are especially harmful to the groundwater. Rock fertilizers not only give nutrients over longer periods to cultivated plants, but also improve the ion-exchange-capacity of soils by forming new clay minerals during the weathering of the fertilizer.

West Africa, partly as a result of the debt crisis, is looking to local sources of rock dust to fertilize crops and to assure basic food production. (*Rock Fertilizers: A Chance for West Africa's Food Production,* Matheis, Agriculture packet, p. 33) Several other agrogeology studies are also represented here.

Third, is the grass roots movement concerned with the premise of John Hamaker in the book *The Survival of Civilization* that remineralization is not only the key to restoring soils and forests, but in the larger context, absolutely necessary and urgent to reduce levels of carbon dioxide in the atmosphere and stabilize the climate.

Our aim is to encourage and promote remineralization research in the U.S. and elsewhere. Forestry pathologist Robert Bruck, Ph.D., and Director of the Environment for North Carolina said in an interview:

"I honestly believe funding needs to be found for an international conference on this. Bring in experts invited from different walks of life and areas to get together a published proceedings that's widely distributed to get this information out. Part of the biggest need we have right now is for people to talk to each other or send reprints to each other. Very often they're in foreign languages we don't understand. It seems the amount of information that's out there, although it's fairly substantial, is completely disorganized right now, and needs to be brought together." (***Remineralize the Earth,*** Issue #3, 1992)

Greg Watson, Commissioner of Food and Agriculture for Massachusetts, writes in this issue, "spurred by the encouraging results of his work on Mount Mitchell, Dr. Bruck is renewing the call for a conference. Bruck feels that such a gathering would provide members of the growing network of proponents of remineralization with the first opportunity to meet and begin to work towards a global soil remineralization research agenda. Joanna Campe and I agree, and are committed to pursuing that goal..."

We hope that these Agriculture and Forestry Research Packets succeed in making these studies more accessible. We also expect to have an international conference in the near future.

If you are interested in ordering these packets, please see the *Resources* section on page 70 for more information. In the same section is information for ordering a copy of *Bread From Stones*, by Julius Hensel.

Climate Change versus Think Change

by John Hamaker
December 21, 1992

Politics

When, in the mid 70's, politics dictated that grant money should go only to those science specialists who forecast a"warming" of the world, it gave an incorrect basis for public policy. The result may be our extinction.

Newsweek (11/23/92) has an article by Gregg Easterbrook titled "Return of the Glaciers". Under the title in bold print, it says, "Scientists think the next ice age will begin within the next 2000 years." On page 63 I read "...several centuries might pass between the onset of advancing glaciation and the first evacuation of what are now habitable regions."

A reader must get the impression that glaciation is not an immediate problem. The fact is that the earth has been trying to move into 90,000 years of glaciation since The Little Ice Age began about 400 years ago. Still fertile soils, much more forested land and far less people exploiting forests and soils are the principle factors which until now held off the start of glaciation. Now all the factors are in place and glaciation has already begun.

As long ago as June 9, 1986, *U.S. News and World Report* carried a report on a meeting of the American Association for the Advancement of Science. One of the things discussed was the ostensible contradiction between increasing depth of show and ice at Antarctica and the rising sea level as measured on shore lines. They failed to understand that the increasing weight of ice forces the crust under the ice to sink, thus squeezing the molten rock between the crust and the mantle. This causes the molten rock to flow toward the lower latitudes, thus raising the land. The sea floor being less than half the weight of continents is first to respond. When it rises, it takes the ocean level with it. The thin California crust is subject to the same thing, which makes the predictions from seismic studies just about useless.

The ability of the melt to flow compensates for any buildup of weight of ice. It prevents an imbalance of centrifugal force which might otherwise be very destructive to the whole crust.

In the late 1880s the flow of melt was from the middle and low latitudes to the upper latitudes as the ice melted. The Madrid earthquake caused the land over a wide area to drop as much as nine feet. The earthquakes of recent history have caused land to rise, thus indicating a reversal of flow going now from the upper latitudes to the middle latitudes. Thus we generally get a rash of earthquakes and volcanoes in the spring and fall in response to the build-up of snow in the upper latitudes of one hemisphere or the other.

Gregg Easterbrook describes Hamaker as an "amateur scientist" and "professional prophet of doom." That is not the usual description of one who was for about 30 years described as a "registered professional engineer", the requirements for which are technical competence and responsibility.

If *Newsweek* or any other magazine wants to level with its readers on what the climate is really doing, all it has to do is establish that the glaciers in the upper latitudes are advancing. They will be advancing only if the weight of snow is increased. *That deepening snow and ice is glaciation.* It won't stop because the factors which caused it are getting worse day by day.

Senator Gore held hearings on the climate change. He and Easterbrook apparently relied on the same people. Gore says in his book [Gore, Albert, *Earth in the Balance: Ecology and the Human Spirit,* Boston: Houghton Mifflin Co., 1992.] unequivocally that there will be a warming. If the new administration waits around for a warming, we are all dead.

Governor Clinton's economics are not derived in concert with the knowledge of impending environmental disaster. Nothing he has said will provide this nation with the strength required to effect our survival.

The warming of the Earth was arrived at by a small group of government-financed scientists. They assumed that the upper latitudes would warm up first. The opposite has occurred. They ignored the biological conditions on the surface of the earth. They ignored the workings of the tectonic system. I see no reason to place any confidence in people who practice such sloppy science.

We know from pollen, sea floor and Greenland ice studies that there is a short period (about 20 years) in which there is a change from interglacial to glacial conditions. That period has passed.

As the situation exists today, *I think we have no better than a 50-50 chance of returning to interglacial conditions, and that only if the new administration can get its thinking up to date and make a "no-holds barred" attack on the problems.* It will take 15 or 20 years to get an effective program going. During most of that time the glaciation will be establishing its grip on the world. We have already lost thirty days of growing season.

To return to interglacial conditions, the government must mount a program to remineralize the Earth the way glaciers have done during the twenty-seven 100,000 year cycles of the past. As the glaciers grow and move, they grind the rocks of the Earth. Wind-blown dust covers the Earth to remineralize the soil.

In order for the nation to have the economic strength to mount an effective program, the debt must be lifted from the working force by radical redesign of the economic laws. So far we have heard that deficit reduction is the centerpiece of economic reform. If that's the best that the new administration has to offer we are in real trouble.

The only sensible approach to reducing sickness care costs is to reduce sickness by remineralizing the soil and eliminating the nonbiodegradable synthetic organic chemicals. The same things are necessary to solve the education problems. The things that need to be done cannot be done while we maintain an economy which is nothing more than a gambling system which benefits the rich at the expense of everyone else.

Gravel Dust

We know that the best dusts come from glacial moraines and outwash plains and from volcanic ash. These dusts are composed of both sea floor deposits and a mixture of molten rocks from the crust of the earth.

Indications are that after gravel has traveled a long way in a stream bed, it loses its original complement of minerals. One or several elements are presumably lost, probably because they are imbedded in soft or soluble stones.

We will not know what is missing from the inferior gravel mixtures until we have collected a number of analyses which include 92 elements. We may then find that adding a small amount of flow lava or sea solids, etc. will bring the gravel dust up to maximum productivity. Maximum productivity of gravel dust results from fineness of grind. The finer it is is ground the more surface area it has for soil organisms to feed on.

Soil organisms multiply to the limit of their food supply, which consists of minerals and the gases in the atmosphere plus water. None of these things is readily available in a hard, dense soil that has been stripped of organic matter by stupid farming methods. We must put all available organic matter back into the soil in order to get deep, well-aerated soils with large capacity to hold rain water.

Soil organisms are the originators of life from the inanimate materials available. I call these "life compounds". Plant feeder roots break open the cell walls of micro-organisms and take the life compounds. The life compounds plus gases taken from the atmosphere by photosynthesis are the plants' food supply. Plants supply the life compounds for all people, animals, etc. Plants also supply the products that photosynthesis contributes.

A lot of different elements are involved in the composition of the life compounds. If the elements are missing or are in short supply, the compounds which require these elements will be missing or in short supply in the plants and in the people who consume the plants. Since each life compound has one or more functions to perform, it is clear that people who consume such food will have serious health problems. Couple such food with a large number of nonbiodegradable synthetic organic compounds (virtually allow which kill and/or mutate body cells) in the air, soil and water, and it makes Bill Clinton's promise to reduce sickness costs ridiculous. He could do it by outlawing the manufacture of organic chemicals immediately, phasing out fossil fuels and remineralizing the soils. These reforms along with the economic reforms I have advocated in Chapter 7 of *The Survival of Civilization* [Hamaker-Weaver, 1982] would give us a good start in our effort to return from the onset of glaciation to the interglacial climate.

Sewage Treatment

Streams, rivers, lakes, estuaries and underground water supplies are contaminated with untreated sewage and synthetic chemicals. As stated above, the manufacture of the nonbiodegradable chemicals must be outlawed.

Sewage plant designers are not aware of the fact that digestive systems remove from food the compounds containing the minerals. What is left is mostly a carbonaceous residue which cannot support a good growth of micro-organisms in the aeration tank without the addition of minerals. I did a "bucket test" on first stage effluent. After 24 hours in my aerated fish tank, a sample of this second stage effluent was tested by a sewage plant chemist. He reported that it was the clearest he had ever seen, and that the phosphate removal was 97%. In a fully developed process it could be close to perfect.

Rail car loads of gravel from glacial moraines can be stockpiled at the plant and fed into a gravel grinder, probably a ball mill. The first stage settlings can be fed into the mill for fine grinding (by the gravel) which is important in getting a fast, complete breakdown in the aeration tank.

Offensive odors from a plant are caused by anaerobic breakdown. Aerobic organisms can consume large quantities of the gases released by anaerobes. Any offensive material that is coated with [rock] dust will be quickly coated with aerobic organisms. A properly designed and maintained plant should release little or no odor. It should release enough excess minerals into the stream to clean up the organic materials in it.

It may be that the answer to septic tank and drainage field problems is to use storage tanks which are periodically pumped out into tank trucks which take the sewage to a small sewage treatment plant. Materials recovery plants should observe the same principles to treat organic material.

These are all development projects. They all cost money. Unfortunately there are few areas of the country which are financially able to vote for more debt and more taxes. Once again, it is apparent that we cannot make a try for survival unless we first attend to"the weightier matters of law and justice."

John Hamaker,
Seymour, MO

The Survival of Civilization
by John Hamaker and Don Weaver

The groundbreaking book regarded by a growing movement worldwide as the blueprint for restoring ecological balance through remineralization and climate stabilization –

"I will tell all those inquiring of me about matters relevant to our survival that they had best read Hamaker's book The Survival of Civilization.*"*
Buckminster Fuller

"We have everything to gain by remineralizing the soil, and everything to lose by failing to do so."
John Hamaker

TO ORDER: Send $12.00 postpaid to Hamaker Weaver Publishers at either address:

Don Weaver
P.O. Box 1961
Burlingame CA 94010

John Hamaker
Rte. 1 Box 1490
Seymour MO 65746.

INTERNATIONAL

Editor: We encourage readers to communicate and support each other through the networking of information, advice and in other appropriate ways ...

From Nigeria

(This letter was sent to Don Weaver, who said such things make it all worthwhile!)

I am glad to tell you that the book (*Survival of Civilization*) arrived in good condition. The gift is quite wonderful and those who saw it have been very anxious to read it through. The book represents that pearl of great price which was discussed in the Holy Bible and it gives me a lot of pleasure. Don, thank you, and may the author of Life reward you quite above your imagination, as I cannot meet up with the price due to foreign exchange problems and high costs of things in Nigeria at present.

John Hamaker has been an inspired author with great insight and perception about the future condition of our planet Earth. The three capital problems which the book emphasized should be an object of great concern to mankind. Many high-ranking government officials described the book as a golden box containing innovative ideas and solutions to problems.

My own group here is made up of young students. We have launched tree planting exercises more than once since last year. We teach people that life needs reverence and that the Earth needs to preserve its vegetation for its beauty and for the survival of man. We also canvas that sea creatures be not killed or disturbed with destructive chemicals.

We would have accomplished much but for lack of funds to forge ahead. We would appreciate any move you may be inspired to make towards helping us. In fact, we need assistance in this undertaking. I have been in steady communication with Sister Betsan Coats of Australia. She has great concern for us. Have you videotapes and cassettes for this programme? If it will be possible, such items will accomplish much here.

Brother Isaac P. Okorie
P.O. Box 62
Okposi Okwu
Ohaozara Lga - Abia State
Nigeria, West Africa

I read *The End* and *Secrets of the Soil* and wish to join the people doing something for Earth via SR.

Gil Yodfat
Tokyo, Japan

Peace Corps in Panama

I am a Peace Corps volunteer working with subsistence farmers in Panama. I am trying to promote sound, sustainable agricultural practices and would be grateful for any and all information you could send me in soil improvement or farming in general.

I work with soils that are highly leached and have been able to find little information on organic farming in the tropics. Also any leads to possible other resources would be greatly appreciated.

Laurence Roussel
Cuerpo de Paz, Apdo. 55-2205
Paitilla, Republica de Panama

Peace Corps in Guatemala

I am beginning Peace Corps Service in Guatemala. My program is Integrated Agricultural Systems. I ran across your newsletters and a pile of papers from Hamaker/Weaver during travels in Costa Rica (Ed Bernhardt's New Dawn Farm). As a biologist I understand the Ice Age argument, but my greater interest is in rock dust and its possibilities. Gracias.

Bill Lucey
Box #59, Cuerpo de Paz, 8 Calle 6-55 Zona 9
Guatemala Ciudad 01009, Guatemala, C.A..

Organic Farming Beginning in Turkey

I am converting 20 acres of land into organic farming. I will be one of the "firsts" in our area. I have taken your address from the book *Secrets of the Soil* which I find very interesting. Please send me more information on this technique (remineralization).

Mehmet (Mike) Arasli
Cumhuriyet Mahallesi
Ziya Gokalp Cad 21/5, Tire, Turkey

SR in the Phillipines

We are a non-stock, non-profit, non-governmental organization composed of individuals and groups whose charter is to apply the theory of sustainable development to the tropics and sub-tropics through Ecological Agriculture (Organic Farming and Humane Animal Husbandry), Environmental Health Bionutrition and Alternative Medicine), Agroforestry (Conservation of Natural Resources and Preservation of Wildlife) and Bioregionalism (Simple Living, Land Stewardship, Steady-State Economics, Participatory and Appropriate Technology, Eco-Feminism).

The Institute For Sustainable Rural Development Foundation, Inc.
PROSAMAPI, Isarog Farms
Palestina, Pili, Camarines Sur
Bicol Bioregion, Phillipines

A Challenge to Find Dust in South India

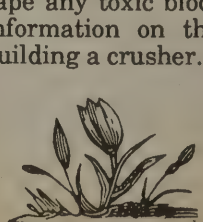
I got three samples from America: Rado Rock, Azomite, and some basalt dust. They did well. The two first ones are of course out of the question here. Basalt dust gave good results in our soil. Now I only have to find a source of basalt here in the South. A friend geologist said there is no basalt in South India! Seems unbelievable! The Kamarajar University in Madurai has a research project running on rock dust! I will try to find some source of basalt here and do more tests. I'll be happy to inform you of eventual success.

Bernard, Revelation Farm
Auroville 605104, India

From a Letter to Betsan Coats

I am an organic avocado producer with a wind generator that produces too much power on windy days for me to use. My farm is also littered with basalt which is 1.4% potassium and 9% calcium. A rock crusher that works on windy days would provide me with nearly all my fertilizer needs without any greenhouse effects. By adding the minerals to compost heaps I would also escape any toxic bloom problems. I am keen to get more information on the machinery, especially a plan for building a crusher. Could you help me?

David Roby
P.O. Box 83
Alstonville, NSW 2477 Australia



Public Invited to Remineralized Gardens

We are moving on to a second, and larger, Earth Regeneration Centre! I have no idea where the resources are coming from to establish permaculture on seven acres, but I'm sure everything required will manifest at the right time. If any readers of ***RE*** from Britain or Europe or further are interested in helping in *any way* I would be very grateful. Having been unwaged for 15 years, and with 5 young children, my resources are few.

Our present garden at Scotston (5 years) was one of the organic gardens open to the public all over Britain last August 1-2, organised by Henry Doubleday Research Assoc. At least 100 visitors came, including farmers and present and former presidents of the McCarrison Society, and George and Frances Ripley from Findhorn Foundation who have themselves been remineralising. Everyone was impressed by the size, health, quality, vigour and taste of crops, besides ideas such as non-digging, remineralisation, permaculture, tree nurseries, or allowing vegetables to flower and seed in harmony with ozone depletion.

I sent some peas, oats, wheat and barley seeds from the garden to George Ripley, who is having them analysed for minerals, trace minerals and protein. No results as yet. Will keep you posted on that.

Cameron Thompson,
Earth Regeneration Center
3 Cottage, Scotston Farm, Auchterhouse, Dundee,
DD3 0QT Scotland

Cat Litter and SR

I have been studying geology part-time at London University for the past three years solely because of my deep interest in SR. I've also been doing part-time freelance gardening, testing some rock powders. I am attending a course of lectures on glacial and penglacial geomorphology at one of the colleges of London U. I have also recently discovered that my garden is on a river terrace deposit consisting of gravelly, clayey sandy silts. I've been digging it out with a pick and shovel and spreading it on the rest of my garden to see what happens. It's extremely sticky at this time of year. It's not a glacial gravel, however, and the gravel seems to consist mainly of flint, which is supposed to be derived from the extensive chalk deposits in southeast England. And I haven't got a grinder to grind it up.

Do you know what John Hamaker's cat litter is, as mentioned in ***SR*** (Spring 1987, p. 8)? Hamaker says there that it's old glacially ground gravel. I am wondering whether any cat litter sold in England is also glacial gravel dust. I have found the following two types of cat litter marketed here:

a. Sepiolite– a mineral from Spain

b. English Grey Fuller's Earth, natural calcium montmorillonite clay. I have found and experimented with Fuller's Earth granules quarried at Redhill in Surrey and Clophill in Bedfordshire, both types being from the Cretaceous Lower Greensand geological formation. There is also a Fuller's Earth quarried at Bath in the Jurassic Fuller's Earth geological formation. This Jurassic Fuller's Earth has a high calcite content (10-40% $CaCO_3$), whereas the Cretaceous Fuller's Earth has a much lower calcite content. The usual theory about it's formation is that it is an altered in-situ volcanic ash. I have not come across any theory in the geological literature that it is a glacial gravel dust.

I have a chemical analysis of calcium montmorillonite clay sent to me by the producer (Laporte Earths). This analysis does not seem to match the average continental crustal abundance figures. The Na Content is exceptionally low.

I have tried the cat litter in potting mixtures without exceptional results so far, but then, John Hamaker said that his cat litter was slow to act. Many factors prevent it from working fully, like lack of water, lack of humus, cold temperatures and waterlogging. I have been told by the producer that the granules do not contain any additives. Wyoming (USA) bentonite (sodium montmorillonite clay) ground to 200 mesh (75 microns) particle size is also available from the pottery trade and from the Rudolf Steiner people but I haven't tried it yet. This is commonly regarded as decomposed volcanic ash.

I have not yet located any glacial gravel dust from a quarry. The local sand and gravel in and around London seems to be mainly flint. The river terrace deposit in my garden is also mainly flint. Since I've run out of money, this is the material I shall be testing the next growing season. Spreading it now will give it time to weather and break up on the surface of the soil. Then I can mix it in deeper when it dries out somewhat in the spring and sumer. We've had a lot of rain recently and my garden is very muddy.

Calcined Fuller's Earth is also sold in this country for adding to turf as a top dressing after spiking it to improve aeration. I have not tried this product.

On reading the literature for England, I have found that many glacial tills do not seem to have the average crustal abundance composition. In East England there are many chalky tills (chalky boulder clay) which have a very high calcium carbonate (calcite) content, because former ice sheets have abraded extensive chalk bedrock found in this part of the country. Someone has given me a very small sample of Milton Keynes chalky till which has about 30% $CaCO_3$ (=12%Ca) compared to a 4.7% Ca for the average crustal rock.

Andrew Kozlowski
London, England

Remineralizing in Canada

I found your address in an *Organic Gardening* article on rock dusts as soil amends. I am vitally interested in learning more. We live on an island without access to manures, spoiled hay, etc. Except for having limited amounts of seaweed, it's a real challenge to provide minerals for our large vegetable garden and orchard. We green manure about half the garden each year, but this is only a partial solution to maintaining soil fertility.

Flora Baartz
Lasqueti Island, B.C. Canada

A local group here organized what they call the R.O.T.S. – Recycling Organics Together Society. They started as a cooperative venture and have created a space near the airport where people are encouraged to bring their organics (or call to have the grass clippings, etc. picked up). They manage to get help via donated tractor work or fellows from the correctional institution to turn the piles. The final product so far has been used for community planting projects. Sad to say, I have not found time to join the group, but they know I am "with them" and doing what I can. Their story might encourage other small towns to do the same. In Yukon there are approximately 30,000 people and 22,000 of them live in Whitehorse. The city has a transient population. Keep up the good work.

Marien Schmidt
Whitehorse, Yukon Territory, Canada

Editor: You might encourage R.O.T.S. to add rock dust for improved flavor and nutritional value in their garden produce.

Remineralizing in the Tropics

We are living in Puerto Rico and farming on mineral-deficient soil. When we read *Organic Gardening*'s article on rock dust, we decided to write and ask if you know where we could locate volcanic rock minerals specifically to grow papaya. Would you send us the names of companies that might be a good source for us, especially anything happening in the Caribbean.

Lynn Connor, Tropical Organic Farming
P.O . Box 2077
Aguadilla, Puerto Rico 00605

IN THE U.S.

Nutritional Health and Minerals The Electrolyte Connection

Having just received your magazine for the first time (Issue #3) I proceeded to read it with great enthusiasm, as the magazine name alone excited my senses! As all the articles published were both of high caliber and extremely relevant to our food farming problems of today, I was particularly impressed with the article by Harvey Lisle regarding the soil in relation to trace elements and the formation of electrolytes therein. This area of soil nutrition has been grossly overlooked in most farming methods.

My many years of experimentation with electrolytes for human, animal and plant health has led me to the conclusion that, in fact, we are a "total" product of the soil, be it from the plants we eat directly or the animals. Without going into further detail at this time, suffice it to say that as a practicing Naturopathic Physician for many years, I have no doubt that without a trace mineral balance in our bodies as nature intended, total health cannot be achieved.

From my perspective, encouraging articles from many sources (concerning) soil health and its relationship to human well being would appeal to a broader spectrum of people now finally becoming aware of the overall relationship of nutrition and disease. I am writing to many in my field of nutrition and urging them to subscribe to ***Remineralize the Earth.***

Dr. I. Gerald Olarsch, N.D.

The Critical Role of Minerals for Optimum Health

I ask that you find it in your heart and soul to inform your respected readers of the critical role minerals play in maintaining an optimum level of health for not only our suffering plant life, but for human life as well. For example: trace minerals support glucose homeostasis by their ability to potentiate the action of insulin, and by being a likely key in pancreas metabolism. This is very important to the millions of people who have diabetes.

Trace minerals are also known to slow the aging process by the production of super oxide dismutase (SOD), a powerful antioxidant that fights free radicals which would normally destroy cell membranes and lead to cel-

Response to the Lisle Article

Feeling Misgivings

As I read the latest issue I felt some misgivings. To be sure, the magazine is beautifully laid out and it provides a wealth of information. And yet, at times I am bewildered because it seems to be a forum for any and all contributions, whatever their basis.

I consider one of my main objectives to be educating and disseminating information closely aligned with what I've learned from Hamaker-Weaver. Their position is quite clear, straightforward and devoid of mystery.

Hamaker favors Nature's grand mixtures of rocks in glacial moraine for a broad spectrum of elements. The article on page 20 of your Spring 1992 issue mentions a material that is described as coming from a "massive tubular deposit." Using material of this nature, or any other material from a site of more or less homogeneous deposit, is a good first step in soil remineralization. What is important to remember, however, is that germane to Hamaker's thesis is the concept of *mixed* material, whether mixed by glacial action or man. It isn't really that important whether the consumer uses a broad-spectrum glacial dust of high quality or if s/he uses *several* narrower spectrum dusts which are found at "pit" quarries, or sites of relatively homogeneous deposit. It *is* important, however, that the consumer strive to add to his/her soil the material *or combination of materials* that offer the broadest, most balanced spectrum of elements.

And for your incredulous readers: That glacial moraine can be found with 60-70 elements is easily understood once one knows how it is formed. The glaciers scour hundreds of miles of territory gathering rocks as they traverse differing geological pockets. This "collecting" of material from diverse locations ensures the broad spectrum of elements in the moraine...hence, Nature's grand mix. It should be noted here that after a year of fruitless search for a U.S. lab that could accomplish our analyses, we were finally directed to Canadian labs. It was explained to us that Canada had a more developed metallurgical industry, and their labs were commensurately more able to meet the diverse needs of that industry. Two labs that have earned our every confidence are: Elemental Research, Inc., (604) 986-0445 and CANTEST, (604) 734-7276. *(See Gravel Sources on page 67)*

David Miller's article is very helpful and necessary for the energetic, independent sort who likes doing things for him/herself. But I didn't pick up any mention of checking up on the geology of the local area, nor was there any advice of collecting dusts from different locales to get a good mixture of minerals. If the importance of *mixture of parent rock* is overlooked, we risk continued soil imbalance. The microbes need the broad-spectrum mineral source from which to choose the elements *they know* they need to come to balance. Chemical fertilizer gained its popularity because it "gave results" from just a few elements. And we all know the rest of the story.

People (and the SR movement) are compromised when they are led to believe just any kind of dust will do, and expect it will give the broad benefits of remineralizing written about by Hamaker-Weaver. I often explain to those who are interested just how to go about accessing their own dust, and it entails far more than just finding the nearest quarry.

I wonder what Hamaker would say about the issue of "life" in rock dusts. Could a newcomer to soil remineralization be confused by this mysterious issue? According to my understanding, rock dusts do not act (they are inert) but are *acted upon* (ingested) by microorganisms.

By your good judgement and good graces, St. Toepfer's article was accompanied by Hemenway and Weaver responses. I didn't respond to it because I felt it would aplular aging and death. Trace minerals are also found beneficial in the prevention of heart disease, tooth decay, hair loss, ulcers, skin disturbances, stress and many other negative conditions that we are faced with today.

We must elaborate on the therapeutic benefits of trace minerals and their biochemical effects. As a holistic health care practitioner, I cannot emphasize enough how important trace minerals have become to me in the successful treatment of my patients. Please educate your readers by providing them with more articles on soil minerals and human health.

Shawn D. Mueller, C.S.T., L.M.T.
Venice, Florida

It's funny the way things come together. Just a couple of days ago I finished reading *Nutrition and Physical Degeneration* by Weston Price, a wonderful and intriguing book which left me with the desire to find out what could be done – by natural means– to help depleted soils become more fertile. The next day, completely by accident, I ran across a small hand-out about the very subject, and a copy of your publication!

If one wants to remineralize the land to be used for a home garden, how does one go about determining how much of what minerals the soil needs? Also, can it be overdone with the result that - as with too much unnatural fertilizer - the plants get too much too fast and "burn"? I would greatly appreciate it if you could clear these points up for me.

Carol Stafford
Santa Cruz, CA

Editor: Please see The Rock Dust Primer *on page 6 to determine amounts of rock dust to use. If you purchase a product specifically for agriculture, follow their recommendations. With the kind of rock dust we normally advocate there is a slow and natural release of minerals and burning is not something to be concerned about. If the rock dust is pelletized and water soluble, such as Planters II, you should follow the recommended dosage.*

Rock Dust Gets Results

I have been using rock dust for several years now on my small farm and am enthusiastic about the results. Some friends of mine discovered some excellent mineral deposits in this area about 20 years ago and have been experimenting with it since then. The findings are impressive. Dying orchards have been brought back to life, and the fruits taste wonderful.

Being a nutritionist, I'm aware of the great importance of including foods in our diet that were grown on mineral-rich soils. I know it makes a big difference in people's health.

Patricia A. Starr, Rising Tide Nutrition
Hotchkiss, CO 81419

It has been two weeks since I read *Secrets of the Soil* and obtained your name, and even then I had to read this copy quickly as it was an interlibrary loaned from my public library. I have since sent in an order for my own copy, but cannot wait to pursue the subject of soil remineralization. It is too exciting, hence, I am writing

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pear I had an "ax to grind", whatever I wrote. I can only trust that the readership will read through all three articles.

I am probably a purist, and quite possibly simplistic when it comes to soil remineralization. I realize the movement is wide open and needs a forum like *RE* for various and sometimes divergent attitudes. Perhaps the best I can do is to suggest that anyone interested in SR in general, and Hamaker's thesis specifically, owes it to themselves to read or re-read *The Survival of Civilization.* (See *Resources* on page 70)

Yvonne Marie Rado, Rado Rock
Eureka, MT

Harvey Lisle responds:

I would like to respond to Yvonne Marie Rado's letter. She admits to being a "purist and possibly simplistic when it comes to soil remineralization". Life gets ever more complicated, which many of us regret, but trying to look the other way or avoiding the complications doesn't work. They must be faced. We are discovering more facts about rock dusts, different ways to use them, more benefits they give us, how to improve the health of our soil, our crops, our animals and ourselves. This does increase the complexities of using rock dusts and takes them out of the simplistic realm.

Most of us, I hope, would vote for progress in our understanding and use of the rock dusts, even though it does make their use more complex. The knowledge of Hamaker-Weaver is still basic and very sound. Are we not permitted to expand upon this knowledge? If ***RE*** does not keep current on rock dusts, then it will fall behind, and other more progressive movements will lead the way.

I don't ask readers to believe everything I write any more than they believe everything the politicians, business or religious leaders write. To do so would be naive. Remineralizing the earth is *not* a science. It is an art. Those of us who do write, write to put forward our findings and our views – not necessarily to proclaim some profound truth. We are slowly groping our way forward, so let's be patient with each other.

Harvey C. Lisle
Norwalk, OH

Controversy Continued . . .

I feel a great blow was struck against the remineralization movement by allowing Harvey Lisle's..*[article]* to run as a feature in the Spring 1992 issue of ***Remineralize the Earth.*** Not only was it lacking in new or interesting information, it was also magically misleading and contained several errors in fact and in theory.

The most blatant of these errors is Harvey's claim that "living" rock dusts are enzymes. Rock dust is not alive. Rock dust is finely powdered rock composed of minerals and elements that have been studied and understood for many centuries by many people. Rock dust can be the food of life, but is not life itself. Enzymes also have been extensively studied and are well understood by many, not including Mr. Lisle. Enzymes are produced by living organisms and act as keys to unlocking the bonds that hold nutrients together, making them available for organisms to assimilate. Human enzymes are so well known that they have names and have been a part of general human nutrition understanding for many years. Enzymes contain minerals and elements that are found in rock dust, and broad spectrum rock dusts can be used to supply these minerals and elements to living organisms. Living organisms can use them to produce enzymes and other important bio-products.

Mr. Lisle says he tests for "living" rock dusts by dowsing. I believe that he is detecting something in the variyou in request for any information you could provide me regarding soil mineralization.

Down to Earth (Organic Gardener's Supply and Service) aligns itself as a promoter of organic soil building materials, practices and information; and the multitude of other philosophies and actions related to that end. Our goals are not to "get rich" in organics, but they are to have this business be a self-supportive tool in which to serve the general public with information and materials that are otherwise extremely hard to get.

I will be teaching low- cost, community- based organic growing classes this summer, and would like to be able to be well versed enough in soil mineralization to pass the information on, along with reference sources where interested people can find out more should they desire.

Deborah L. Marcucci
Down to Earth
4625 Ashberry Drive, Sarasota, FL 34234

I just finished my first reading of *Secrets of the Soil* and was encouraged by the idea of SR. My garden plot here in Kansas is solid black clay. Planting a seed in it is equivalent to choking a baby to death. It holds absolutely *no* water. It has been raining here constantly, practically since last October, and the first rainless day after a rainy period I have to water because the soil is dry as a desert! So I will be very glad to learn more about SR.

Victoria K. Zeller
1832 Ohio, Lawrence, KS 66044

Editor: It sounds as though your soil needs large amounts of organic matter to improve its texture and water retaining capacity. Till in compost, peat moss, chopped leaves or hay, grass clippings – with your rock dust to create humus. You might even want to add sand. Remineralization works best when it goes hand in hand with good organic practice.

Volcanic Ash

Am wondering about the difference between the fly ash from volcanos and the rock you pick off the side. Have a quantity of this summer's ash picked up in Anchorage, but this should be totally different from the flow rock picked up off the side?

John Finley
Bear Land Services, Box 3849, Kodiak, AK 99615

Zoo Manure and Remineralization

I have gotten your name from the appendix of *Secrets of the Soil* by Tompkins and Bird. I am the Grounds Supervisor for a new 100- acre campus just north of downtown Tulsa and have been fortunate in receiving permission to compost the Tulsa Zoo manure and care for the grounds without using any agricultural chemicals. While I have been interested in remineralization for years, I have never used any rock dusts.

We have used significant amounts of greensand and rock phosphate on our campus along with our compost, milorganite, fish emulsion, seaweed extracts and Fertrell fertilizers. The greensand seems like an outstand-

Response to the Lisle Article

ous rock dusts that he tests, but it is not life. What he detects is water or energy fields just as all dowsers do. Another test he quotes is a reported experiment by Herman Meinke. It involves growing algae using the rock dust being tested. The algae growth is a product of the minerals and elements contained in the rock dust and the water being used by the algae with the help of the sun. The algae are present in the air and water and are the living constituent in the test. In Herman Meinke's own quoted words, "the living rock dusts *promote* life", and I add, are not life itself.

In closing, I would like to say that too many people have worked too hard trying to understand rock dust, find suitable deposits based on analysis and testing, and promote its use in the fields of agriculture and nutrition, to allow magic (cosmic dowsing) and unsubstantiated self claims to lead people down wrong paths and to give the scientific community an easy way to disqualify the remineralization movement as interesting but not based on fact.

As for myself and my working circle of rock dust researchers, engineers, agriculturists, entrepreneurs and others interested in the survival of the planet Earth, we beseech you to maintain ***Remineralize the Earth*** as a forum for the Hamaker-Weaver network. This forum, if so maintained, will help us in our efforts to change man's effect on this Earth, turn back the glacial clock and ensure a fruitful Earth for our children and grandchildren. Thank you.

Greg Stout
Bella Vista, AR

*Editor: We have a very diverse readership. Sometimes controversy arises if there is an article appearing which seems appropriate to some and not to others. If you think sometimes that an article seems inappropriate, please do remember that it appears on **RE** pages if the **RE** staff feels there are enough readers who are interested in that aspect of remineralization.*

For several years, for example, there have been occasional articles on remineralization from biodynamic and homeopathic perspectives, those who are involved both in remineralization from the Hamaker perspective, i.e., mechanistic application of rock dust imitating the glaciers during an Ice Age, while at the same time exploring it through homeopathic or biodynamic application to make comparisons, and/or find ways to use less rock dust.

An example is Keith Gray of New Zealand, who does both and has received support from the biodynamic community for his experiments.

Dr. Gernot Graefe, a prestigious scientist in Vienna and Dr. Maria Felsenreich began with conventional scientific experiments and have moved on to experimenting with homeopathic application of large areas of forests, rivers and lakes.

The concern about whether rock dust is living or not is of interest to some, but not at all to others. It is a matter of context and definition. It is true that this has not been a topic of discussion ensuing from Hamaker's work, but more from biodynamic and other types of agriculture practices.

Just as Hamaker has been excluded from more mainstream science because his thesis did not fit the "conventional NPK soil science school" taught in universities so biodynamics may not fit that mold either. Yet one has only to read a book like Secrets of the Soil *by Peter Tompkins and Christopher Bird, to realize there is enormous potential in these other modes of farming.*

ing mineral source, but I am wondering if the mineral dusts described in *Secrets of the Soil* might not be more effective. I would appreciate any information you can spare me. . .

Sandy Mueller
University Center
Tulsa, OK

Report from the Whole Earth Festival in Davis, CA

The Whole Earth Festival at U. California, Davis, was the best ever, and I enclose some souvenirs. Jerry Brown came to visit; all the videotaping went off smoothly, and I will never forget the moment when speaker Bob Cannard met Tim Thompson of the recent *Earth Island Journal* article on climate change. There followed a videotaping session by Jay April, a CNN-PBS affiliated Hollywood-type, during which Tim Thompson said to Bob and me – very slowly and quietly - "so, what's the answer?" Bob and I answered in the same slow wondering tone of voice, "remineralization." "With what?" says Tim. (The camera pans back to him) "Rock dust?" "Rock dust", we answer again. As if in a dream, this very low-key future ending to our video was caught, but only later did I realize Tim Thompson wasn't staging it; he was asking a question for his own information.

We are also working along several different tracks here on campus. We are going to do an ozone seminar in January, and I will be presenting the case for SR as a cure for the ozone (to decrease O_2 levels, among other things). If any references spring to mind please let me know, but I think I can find the references I need in our remineralization library. I'm particularly interested in cost/benefits in terms of applied minerals/CO_2 stored. All the other plans for remediating the atmosphere are so far-fetched!

They use water from a really deep well (800 ft.) here on campus, and it has only 75 ppm of calcium, whereas the town water (200 ft. down) has 775 ppm of calcium. In town, plantings done with redwood chips survive, whereas half of everything that's planted on campus with redwood chip mulch dies. I've learned that calcium alone in small doses seems to correct for other mineral imbalance, so this may be an illustration of that principle. Wouldn't bone meal be a perfectly good source of calcium for remediation, for those who can't find rock dust? On a small scale, of course.

I'm going to be moving in with the daughter of a woman whose husband was Rudolf Steiners's main scientist, name of Pfeiffer. Will have access to the entire Rudolf Steiner library, and I hope to learn more about the Biodynamic ideas. They seem to be along the lines of small doses of calcium.

Corky Millard
U.C. Davis, CA

I'm living in northern California where there are many types of rock available. Hamaker was trying to devise large-scale ways to produce rock dust by building

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Harvey Lisle Has More To Say On Paramagnetism...

The last issue of ***Remineralize the Earth*** was especially interesting to me because of the articles written around Robert Bruck and Herb Owen.

I have several pertinent comments you may pass on to them if you wish. First of all, both Bruck and Owen think only of the materialistic side of Planters. Perhaps they are not aware that there is a force field or energy field created around the area where Planters is used. That is why such a little amount will go so far.

I have a small experimental orchard because I love trees and I love fruit and I love to experiment. Picture in your mind the cartridges you get your 35 mm film in. I use these cartridges, one to a tree, filled with basalt (it could just as well be Planters). My trees do well on the forces – not the material, since they can't even get the material. The cartridges are buried just about one inch deep on the east side of the trunk. They channel the sun forces right up the zylem cells, helping in times of drought in the summer and in times of extremely cold weather in the winter.

Another fact which would be extremely difficult to prove is that silica and magnesium are polarities. Silica brings light into the soil and magnesium brings light into the leaves via chlorophyl. In your interview with Bruck the subject of dolomite use in the forests of Germany came up. The magnesium in dolomite would be excellent for the foliage, but what is really needed is silica for the soil.

Unfortunately, the paramagnetism of the rock dusts such as Planters II lasts only several years when spread on the soil or in the soil. Consequently, I replace the basalt at the base of my trees each year and spread it each spring in my garden. Consequently, the work of the EarthDance Institute will probably be only temporary and not permanent.

Harvey C. Lisle
4427 St., Rt. 601, Norwalk, OH 44857

Editor: The November 1992 issue of Acres, U.S.A., A Voice for Eco-Agriculture, *had a front-page feature on* Magnetic Susceptibility *by Arden Andersen. Under the sub-heading* Rock Dusts *it says, “There are two reasons for applying rock dusts. One is to add nutrient minerals to the soil and the other is to increase the magnetic susceptibility (para magnetism) of the soil.” Paramagnetism of rock dust can be scientifically measured and there are readers interested in this, and this is not remineralization as advocated by Hamaker / Weaver, which is the principal theme of this publication.* Acres, U.S.A. *writes about paramagnetism, if you wish to keep up to date on the subject.*

On behalf of basalt rock dust for forests, in an experiment in Czechoslovakia, one application showed positive results for sixty years and four times the timber volume 24 years after the pine seedlings were planted. (See Forestry *packet in* Resources *page 70:* “Information for the Application of Silicate Rock Dust for the Amelioration of Forest Soils,” *Sauter and Foerst.)*

I think that perhaps Planters II will not have such a long term effect and need reapplication for a different and less esoteric reason: The fast weathering properties of the dust. Granite is the slowest to weather of all the rock types. Basalt seems to be ideal for many forests from research available as far as minerals available and its weathering properties. See Forestry *packet:* “The Weathering Properties of Silicate Rock Dust Under Laboratory Conditions,” *Fragstein, Pertl and Vogtmann)*

An advantage of using Planters II, especially in agriculture is that it is water soluble, comes in a pelletized large rock pulverizers. If you have his address, I would appreciate it.

I have read a few articles over the years in *Acres USA* about minerals (rock dust). I would like to be able to read everything I could on the subject of rock dusts. Is there any published info about the approximate mineral ratios of different types of rocks, and additionally, which types work best on plants? And most important, what these different types of rock with varying mineral contents and ratios do to the mineral content of the plants grown in them.

I have studied Dr. Carey Reams' methods and practiced them for the past seven years. I have a strong interest. Can you help me?

David Mall
PO 1722, Mt. Shasta, CA 96067

Editor: Hamaker's address is listed in the Resources *section. Please order our Research Packet for studies and mineral analyses of different rock dusts.*

Incidence of Cancer and Rock Formation

Remineralize The Earth is an excellent resource publication and an informative alternative to the chemical conspiracy.

One suggestion for manufacturers of rock dusts: If you haven't already, form an association. The benefits of associations have been proven by many emerging industries which, like yourselves, have had to educate the public and counter an established power base.

There appear to be quite different values in rock dusts. In J.I. Rodale's book *Paydirt, Farming and Gardening With Composts*, 1945, page 55, he references "a direct relationship between the incidence of cancer and the rock formation from which the soil derives."

"Certain rocks of a dolomitic character which are a form of limestone rich in magnesium, produce a soil which seems to be low in cancer incidence, whereas rock formations such as granites, which are rich in potash, have the reverse effect." Also, does anyone have experience adding rock dust to earthworm beds?

David Kral
Rt. 2, Box 41, Walla Walla, WA 99362

Green Drink

I have a 16' x 13' plot in a community garden in San Diego and raise almost all my own veggies year round at age 74 – and feed two other ladies in their 80s. Also get them to make a green drink every day from leaves of: chard, kale, celery, sorrel, pigweed, mallow, comfrey, parsley, asparagus, dill. Put in blender with ice cubes and one small can pineapple juice, 3 oz. water and 1 oz. aloe vera and blend. Makes 2 eight oz. glasses – good for you.

Mrs. Chris Roberts
San Diego, CA 92116

Thanks for ***RE#3***. I am devouring every word of it. The information gives me hope for our future.

Have you contacted Green Thumb, which works with community gardeners in New York City? Or the Botanical Gardens, which runs a school for future professional

Response to the Lisle Article

form, and adds assimilable minerals very quickly. And because only 250 lb per acre are generally recommended reducing transport cost.

From Colonel Taylor

Addressed Hugh Lovel's camp out, twice, as did Harvey Lisle. Then I continued my tramping of farms on across the South, up much of the East Coast and back across a zig zagging Northern route. As on each of my annual treks, observed the consistent weaknesses in crops which incomplete plant feeding causes. The major difference with 1992 crops was that they starved because standing water made those wet soils anaerobic. Biologically farmed soils insoaked the heavy rains efficiently so that those soils remained aerobic. Much of such damage took place on tiled land – incomplete soil feeding denied ample biotic activity so that dead soils quickly sealed off even recently laid tiles.

One picture was of a 60-acre field of watermelons, with big melons so close you could have walked across the field mashing rubbery, horrible tasting melons at every step. Ed Fuchs, Preston, MD, took 12 years to quit testing miracle products and cure-alls (a photo of him in a cornfield ran on the back page of *Acres, USA* for years) before he tested *Fertimax* Total Soil Management, thus Biological Farming. Despite the cold, wet summer, Ed had the highest quality melons ever. They remained excellent but he refused to sell such high quality melons for a fifth picking at the low price offered. He filled his green bean contract from half the land contracted; his pickle contract from 2/3 of the land contracted. Am waiting for his Fall spinach report.

Joseph Dunsmoor, who was a pioneer in organic produce distribution, went broke because the organic produce would not keep until it could be distributed in spite of refrigerated vans, excellent cold storage facilities, etc. He tried shipping wild citrus from Puerto Rico - only 24 hours by boat from NYC. But that organic produce also spoiled. Joe knows that Biologically Farmed produce has excellent shelf life, appearance and flavor, even when grown in Puerto Rico, and is awaiting a shipment (of *Fertimax)* so he can remineralize and activate those sub-tropical leached-out soils.

Harvey Lisle told Hugh's attendees, "Based on my experience with it, *Clod Buster* is nature's BD (biodynamic) starter." He followed the Bio-dynamic Silica from *Clod Buster* into soils, into food plants, even through cooked cereal. He again demonstrated that dusting trees strengthened their aura by four times – establishing his observations by dowsing. But BD silica-bearing material cannot do the complete remineralization necessary. Sure, a big California stone fruit and nut producer increased his almond yield by 400 lb. an acre by water-running our foliars onto his test areas, and is thus treating thousands of acres. But he's not feeding his nut and fruit trees as completely as *Fertimax* Total Soil Management does.

One of our pioneer clients, John Duell, Greeley, CO, for example, retired. Leased his farm to a neighbor. John couldn't stand by and see that beautiful soil reverted to the horrible stuff it was when John started *Fertimax*, so John came out of retirement, cancelled the lease, and called us yesterday to start shipping.

Leland B. (Colonel) Taylor
Agronics, Incorporated
Albuquerque, NM

gardeners and landscapers? I don't represent anybody but myself, but my garden influences others who see it, and I hope to be demonstrating the effectiveness of remineralization soon with the rock dusts I get from your source lists and ads. Thanks again for providing them.

And finally, congratulations on the terrific mention of remineralization in the May/June 1992 issue of *Organic Gardening.*

Judith Werner
Bronx, N.Y.

I am still working with dust, although at a very slow pace. The 15 acres I have done the past 2 years looks great and the garden, of course, still shows the difference compared to the plain soil. This year I'll use my available resources to remineralize my small livestock pastures. I've started raising Belgian Blue cattle "fullbloods" and I'll let them enjoy the benefits. Haven't talked with Dr. David Miller at Oberlin – sure would like too. Wish he was a little closer to me.

Bob Love
Harmony, MN

I was informed of your magazine through the *Men Of The Trees* Director, Mr. Barrie Oldfield in Western Australia. It was just after his successful rock dust trials in Dowerin, a wheat-belt town north of Perth.

I offer some suggestions to get the message of organic methods known more effectively:

1. Concentrate more attention on newspapers, radio, television, professional audio and video tapes into universities and polytechnics for agriculture and horticulture students. I would also recommend that the libraries have books, tapes (both audio and video) and pamphlets about organic methods of agriculture.
2. Show the benefits to professionals and public alike about the healthy aspects of growing plants with organic methods.
3. Erect public billboards that inform the public about alternative pest-control methods which contain natural ingredients next to the chemical companies billboards
4. Make sure that all learning institutions serve citizen's needs, not an elite.

Peter Wright
University of Minnesota
College of Agriculture
St. Paul, MN

Editor: the ideas are good – all that is needed is funding!

Good for you folks! I've used gravel dust for years with good results ever since Hamaker's book came out, and I'm glad that somebody is increasing awareness of this issue. Send me a copy and I'm sure I'll be a regular subscriber.

Jon Boone Doak
Mt. Horeb, WI

I got your address at the end of a letter in the *Small Farms Journal.* Our soil is sour, and lime or marl must be used all over this area. I do not use either insecticides or herbicides and have trouble with weeds. I have been told by my Dad for years that a lack of minerals more than anything allows weeds, especially quack grass, to get started.

Ed Lawless
Grand Junction, MI

Students Read *Secrets of the Soil*

Hello, my name is Krystal Racca. I am in the 9th grade at Mt. Madonna, a college prep school. Right now in Science class we are reading *Secrets of the Soil.* If possible would you please send me any info you think helpful to our class about soil, Botany, etc. Thank you.

Krystal Racca

I was wondering if I could get some information? I am in a biology class at Mt. Madonna School. We have been reading the book *Secrets of the Soil.* We would appreciate any info you could send us.

Rakmun Bryant-Wick
Mt. Madonna School,
Watsonville, CA

I saw your ad in *Acres, U.S.A.* Tell me, is there a simple way to pelletize rock dust for the small-time operator? We have a laboratory rock crusher capable of crushing 100lb./hour to 300-mesh screen size. Do you have a listing of quarries where the minerals are especially good? Anywhere in the area of Asheville, NC?

John F. Kellen
Leicester, NC

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P.O. Box 842
2604 Burnt Valley Road
Chewelah, WA 99109-0842
(509) 935-4604

Aurea N. Aharonian
18 Rue de la Resistance
26110 Nyons, France
75-26-38-74
I'm a Super Blue Green Algae distributor living in the south of France where lavender and olive trees grow. I want to initiate the cultivation of *Alphanizomenon Flos Aquae.* Radionics, Perelandra and crystals welcome. Anyone with ideas, visions and info please contact me.

William A. Askin
Box 339
High Level, Alberta
Canada TOH 1ZO
25 years organic, moving into rockdust. Welcome all helpful correspondence especially western Canada. Need info for obtaining glacial flour, basalt, powdered quartz crystal, buying or building mill for 30hp diesel.

Joseph Bednarz
425 S. Plymouth Blvd.
Los Angeles, CA 90020
(213) 935-0683

John Berlin
2735 Jackson St.
Hollywood, FL 33020
(305) 922-8592
We are in the process of buying land, forming a spiritual/ ecological community – remineralize and be self sufficient.

Edward Bernardino
P.O. Box 66
Beverly, MA
(508) 927-2068
Natural Organic Fertilizers

Eileen Gunning Blackmore
227 Washington Avenue
Pleasantville, NY 10570
(914) 741-2313
Chemistry teacher (esp. enjoy teaching "Chemistry in the Community" to inner-city kids). Trying to start an experimental plot on high school grounds for young *"urban farmers."* Have studied Western and Chinese herbs and their chemical analyses.

Be Allen and Billy Burke
27 Village St.
Somerville, MA 02143
(617) 625-1451
We want to locate and distribute Native Rock Dust in Massachusetts and hear from other rock dust enthusiasts.

Johnny Papaya Burns and Natividad's Garden
4654 Falcon Ridge Drive
Sarasota, FL 34233
(813) 922-2539
We sell papaya seeds for $2.00/ pkg + large 6" x 9" SASE. We grow and sell papaya and banana trees and fruit. We sell Green Sand from N.J., Fertrell Organic Fertilizers. For info send a double SASE. My wife Natividad and I are both teachers, organic gardeners and I write freelance articles on outdoor life, education, nutrition, snakes, etc.

Rink Da Vee
Shooting Star Gardens
2849 Oregon
Madison, WI 53713
(608) 273-0957
I farm organically about 1 acre near Madison. My market mostly the local Farmer's Market.

William M. Dean
1800 Market Street #219
San Francisco, CA 94102
Spiritual philosopher, computer programmer, economist, ecologist.

John Diamond
Apdo 193-8000
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Jon Boone Doak
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Jeff Fairlee
P.O. Box 135
Alvadore, OR 97409-0135
(503) 485-1515
I am a dispatcher for a sand and gravel company in Eugene OR. We make rock dust and I'm interested in marketing the material.

Melba Figueroa
P.O. Box 1052
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Georgia L. Floyd
94993 Timesweep Ln.
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(410) 997-5203

Audrey R. Hadden
Rt 2 Box 234 A
Hart, MI 49420
(616) 873-3957
Earth aware, living on 80 wooded acres in a self designed passive solar home. Pulling together SR, devas, biodynamics, composting, etc.

Joel Hamaker
P.O. Box 154
Glen Echo, MD 20812
Formal Environmental Planner interested in relationships between environment and consciousness/psychological health.

Robert Herrick
985 Covington Rd.
Los Altos, CA 94024
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Bonnie Johnstone
617 Ross
Ann Arbor, MI 48103

Earl F. Kelley
20 Meadow Wood Drive
Coto de Caza, CA 92679
(310) 414-3666

Karen Kemper
10 Eugene Street
Hood River, OR 97031
(503) 386-3096

Cynthia Knudson
154 Hatchville Rd.
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(508) 563-6377
Grow vegetables and flowers with rock dust to improve soil quality.

David Kral
Rt. 2, Box 41
Walla Walla, WA 99362

Ed Lawless
49700 24th Ave. RR #2
Grand Junction, MI 49056

Bern Laxer
1208 So. Howard Ave.
Tampa. FL 33606
(813) 251-2421
Looking for large quantities of various rock dusts.

Bob Leonard
394 W. Esparanza Blvd.
Green Valley, AZ 85614
(602) 648-2936
I'm interested in organic farming.

Spencer G. Lewis
402 E. Hwy. 121, lot 286
Lewisville, TX 75057
See anarchy (a la Kropotkin to Zerzan) and permaculture (a la Steiner to Illich) as request to each other. And you?

Bob and Marcia Love
Loveland Products
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(507) 937-3445
Large scale organic farmer on remineralized soil. Loveland Products include OGBH certified organic grains, Belgian Blue Fullblood cattle.

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Edwin B. McCabe
11 Dick Court
Northport, NY 11768
(516) 261-7076
I'm sixty-six years old and in the process of moving to a farm in Virginia. On limited funds and the farm needs a lot of work.

Miriam MacGillis
Genesis Farm
RR3, Box 290 C
Blairstown, NJ 07825
(908) 362-6735
Genesis Farm is an ecological learning center sponsored by the Dominican Sisters of Caldwell, NJ. It has a bio-dynamic community supported veg garden with 150 members who are shareholders. It has spread rock dust over 25 experimental and control plots on a 30-acre hayfield. No significant results on lab soil tests yet.

McInnes Natural Fertilizers
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(514) 441-1662
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Hank Nadu
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Lancaster, PA 17601

Jack Nathanson
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Canada H3W 2T7
(514) 344-0911
Presently growing plants on balcony in remineralized soil.

J. Patrick Nicholson
N-Viro
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Alfred Nieforth
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Nova Scotia, Canada BON 1YO
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We have 500 cleared acres plus 150 acres in woodlands, ponds, etc. We are now in forage w/ pasture for sale and remaining cattle from a former dairy operation. We want to know more about SR, biodynamic farming, Flannigans' water, cosmic culture. We plan to plant some of our acreage in various types of trees. I'm planning a trip to the U.S. to some of the mentioned sites to learn more first hand. Correspondence welcome.

Myrtle Odin
8221 Noble Ave.
Van Nuys, CA 91402
Backyard gardener, growing wheatgrass and interested in rock dust for human nutrition

Pacific Organics, Inc.
Rob Gould, Pres.
P.O. Box 12786
Salem, OR 97309-0786
We manufacture organic fertilizer blends using rock powders and compost. (Formerly Willamette Valley Organic Supply.)

Dave Ostrowski
P.O. Box 110626
Campbell, CA 95011
(408) 241-5440
Interested in research in SR for reforestation and sustainable agriculture.

Charles Putnam
461 Cavour St.
Oakland, CA 94618
(510) 654-8068
I currently use rock dust in my garden. I am now using a Kemp circular composter for my organic matter. My current project is to get rock dust listed in a national health and fitness catalog in cooperation with a west coast rock dust producer/supplier.

Fred Seubert
28667 Spencer Creek Rd.
Eugene, OR 97405
Have a large tree farm – interested in networking.

Dr. Refugio Ruiz
Apdo. Postal 958- C
Monclova, Coah. 25730 Mexico
Organic farming in arid zones, role of trace elements in animal and plant nutrition.

Alon and Dina Shomer
Rte. 4, Box 275
Cairo, GA 31728

Lenard Smith
8672 159th Street
Surrey, B.C.
Canada V3S 3S8
Looking into areas of rock dust availability and use in BC.

Patricia A. Starr
Life Care Learning Sanctuary
1220-2640 Rd.
Hotchkiss, CO 81419
(303) 835-8136
A small 4-acre apricot farm, offering meals, overnight facilities along w/ nutritional guidance. The garden and orchards are enriched with High Rocky Mountain minerals (available for sale), a blend of rock dust from nearby mines.

Devin Stone
4145 Clearfork Rd. North
Morehead, KY 40351
(606) 784-9884
Psychopharmacology major, Premed minor, starting and completing radionic and botanical medicine certification. Operating a small forest farm (60 acres). This will be our 3rd annual planting of ephedra, echinacea, cohosh, goldenseal, ginseng, bloodroot, trillium, star root, stoneroot, etc., along with our 2-family organic garden. I research alternatives to orthodox healing.

Aaron E. Stoltzfus
5809 Limeville Road
Gap, PA 17527
(717) 442-8745

Faye Thompson
5200 Chestnut Road
Cantonment, FL 32533-7815
(904) 587-2399

Cameron Thomson
Cottage 3, Scotston Farm
Auchterhouse
Dundee, Scotland
Artist, gardener, writer
and ecologist.

The Water Foundation
Gerry Wass
Box H2O
Brainerd, MN 564001
(218) 829-3616
The Water Foundation is a non–profit organization working to promote practical ways for people to harmonize with the Earth.

Sandra Wood
Vulcan Materials Company
P.O. Box 530187
Birmingham, AL 35235-0187
(205) 877-3778
Vulcan Materials Co. owns and operates over 120 construction materials quarries. Limestone and granite aggregate fines are produced in most all plants located in 15 states throughout the U.S. Contact me for more information.

The Water Foundation

The Water Foundation is a membership organization whose mission is to awaken our civilization to a better understanding of the nature of water: that water is alive in a very real sense and needs to be cherished. We publish *Vortex*, a quarterly cassette magazine, and several detailed education programs are underway.

The Carbon Catcher program will begin on Earth Day to focus public attention on the need to restore carbon balance to the Earth by rebuilding humus levels in soils worldwide.

Remineralization may be an important key to making the program work. For more information, please write to The Water Foundation, Box H20, Brainerd MN 56401 or call (218) 829-3616.

William A. Williams, III
4002 Georgetown Drive
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Gravel and Rock Dust Sources

Finding Local Souces of Rock Dust Suitable for Remineralization

The best way to make inquiries about local sources of rock dust in your bioregion is at the state level. Some states have geological survey agencies. They should have lists and maps.

Or make your request to the local state aggregate association. For a complete copy of this list of state associations send a self addressed stamped envelope and $1.00 to ***Remineralize the Earth.***

Or you can write for newly expanded Gravel Sources in 33 States and Canada for these:

MI, MN, MT, UT, NV, CO, NJ, PA, MD, NY, DE, AL, MS, FL, AZ, NM, IA, KS, NE, ND, SD, SC, NC, GA, VA, MA, NH, VT, ME, CT, RI, CA, OR, and Ontario, Canada.

For a list of gravel sources in your state, send a self addressed large manila envelope with 75-cent stamp to: David H. Miller Dept. of
Biology, Kettering 103
Oberlin College
Oberlin, OH 44074-1082.

Insect Balance

SilKaBen, prevents fungus and deters sucking and chewing insects. Item no. 5-224. Call Gardener's Supply, 1-802-863-1700.

For Safety Masks

Action Mining Services Inc. 1-800-624-151. A mask should be used if applying dry rock dust to avoid inhalation, depending on the fineness of the gravel and wind conditions.

Mineral Analysis

Elemental Research, Inc.,
Robert Brown, President
309-267 West Esplanade,
North Vancouver, B.C.
Canada V7M 1A5
Spectroanalysis of rock dust.
Tel. (604) 986-0445
Fax (604) 986-0071

Cantest, another company in Canada which analyzes samples of rock and gravel dust. Tel. (604) 734-7276

Mineral Health Supplements

Boddy Toddy
Rockland Corporation
Tulsa, OK 74128
(918) 437-7310
(800) 331-3659

See **Maine Seaweed,** Northeast Listing.

Naturopathic Formulations, Inc.
P.O. Box 7594
North Port, FL 34287
1-800-326-5772

Pascalite, Inc.
P.O. Box 104
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Calcium Bentonite clay

Sacred Spring Marketing
P.O. Box 1226
Park City, UT 84060
(801) 649-0322
Clark's Formulas.

Super Blue Green algae comes from a remin. glacier-fed lake; from Cell Tech Inc., Klamath Falls 1-800-321-1303.

Klamath Blue Green Inc. algae based in Mt. Shasta, CA. 1-800-327-1956.

KM mineral supplement based on plant sources, esp. high in potassium. Matol 1-800-237-7002.

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Acres U.S.A. is a monthly journal dealing with biological agriculture. The emphasis is on production of quality food without the use of toxic chemicals. Samples are $2.50 each.

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128 Intervale Rd.
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Gernatt Gravel
Products, Inc.
Robert J. Able
Richardson and
Taylor Hollow Road
P.O. Box 400
Collins NY 14034
(716) 532-3371

Maine Seaweed Co.
P.O. Box 57
Steuben, ME 04680
(207) 564-2875
Sea vegetables and garden fertilizer.

Laurence Lynch Co.
Glenn Burbank
396 Gifford St.
Falmouth, MA 02540
(508) 548-1800
Native stone

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(Lane and Son)
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Amherst, MA 01002
(413) 253-2075
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Lane and Son
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311 East Mt. Road
Westfield, MA
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Traprock and a silt and gravel mix.

Lane Construction Corp.
Jim Merold
P.O. Drawer C
Northfield, MA 01360
(413) 498-2956
Glacial till, 54% through 200 mesh.

Tilcon Mass., Inc.
Attn: Tim Kelly
72 Main St. P.O. Box 114
Acushnet, MA 02743

Tilcon-Arthur Whitcomb
W. Lebanon, NH 03431
(603) 352-0101
Greenstone-meta basalt– They have many sites in NH and VT. Call for info.

Henry Fleischman
36 Union St
Guilford, CT 06437
Contact person for the area.

Judy Roylance
Distributor Planters II
Trace Mineral Fertilizer
Rt. 1 Box 1398, Dogwood St.
Sag Harbor, NY 11963
(516) 725-1009

Kingston Traprock Co.
Dept. 1
Kingston, NJ 08528
Dia-King diabase rock powder. Write for info.

Flora-Stim
Strite's Warehouse
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Greencastle, PA 17225
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William Hurrle
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Green Bay, WI 54302
(414) 432-2882
Dist. for Planters II.

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120 South East Ave.
Fayetteville, AR 72701
1-800-643-8909
Sell Planters II and ELX.

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Cupertino CA 95015
dist. Rado Rock and small seed company specializing in remineralized seeds.

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P.O. Box 1380
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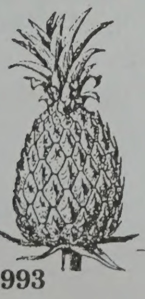

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tel 04213 2044

Sanvita Hartsteinwerk Kitzbühel
Attn: Mr. Abermann
Postfach 44
A-6370 Kitzbühel
tel 05356-4333-0

Robert Schindele Furnierwerk Superbiomin
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DK – 8900 Randers
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ENGLAND

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Technical Manager
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DAN HEMENWAY
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ASSOCIATE EDITOR

Many of us are painfully aware of the severity of catastrophic ecological decline worldwide. ***The International Permaculture Solutions Journal*** delivers information, ideas and discussion to provide Earth-healing tools or to promote their development. Information that is practical, detailed and hard to find elsewhere often turns up on *"TIPS"* pages.

Who Writes for *TIPS*?
Many *TIPS* writers are tops in the movement: Bill Mollison, Jim Duke, Bill McLarney, and our editor Dan Hemenway, for example. Others are people who have been quietly working on their own. They all have something important to say.

What Does *TIPS* Cover?
TIPS issues often follow a specific theme. Presently we have a series of issues on aspects of developing sustainable food systems. After that will be a series on "Permaculture Design: The Process and the Product," and then a series on appropriate technology in permaculture. And of course each issue contains articles outside the theme as well--matters too important to wait. Eclectic book reviews, fascinating letters to the editor, informative illustrations, & easy-to-use format are hallmarks of our publication.

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RESOURCES

Remineralize the Earth magazines

Remineralize the Earth double issue #4-5 is available for $10.00 each.

- 2-9 copies at $6.50 each
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Remineralize the Earth magazine #3 is now available in larger quantities at a special price ***to current subscribers*** for networking:

- 2-9 copies at $3.00 each
- 10 or more copies at $2.00 each

Discounted for book and health food stores. Please contact us for prices. Some past issues are available for $4.00, though most are out of print.

The Best of Soil Remineralization: A Network Newsletter 1986-1990

This volume is currently being organized and it should be ready soon. A collection of the best articles that appeared in the Newsletter over four years. Approximate price, $18-25.00 in the U..S. We'll send out information when it is ready.

Soil Remineralization Research Packets 1993

Soil Remineralization Agriculture Packet

This is a new and updated 1993 research packet on remineralization research around the world for agriculture and orchards. Spiral bound, 146 pp. See Price List on order form, page 71.

Soil Remineralization Forestry and Sewage Treatment Research Packet

Also new and updated. Spiral bound, 82 pages. See order form for prices on page 71.

Hamaker Weaver Publishers

The Survival of Civilization by John Hamaker and Don Weaver ($12.00 ppd.). This important book is the foundation on which remineralization and the grass roots movements rests.

The Solar or Ice Age? Bulletin

(366 pg.). Don Weaver has put together current events supporting climate change from the coming Ice Age perspective, including recent volcanic and tectonic activity, what's happening to forests, and weather and global networking of SR news. Suggested minimum donation $10.00.

Don Weaver, Hamaker-Weaver Publishers, P.O. Box 1961, Burlingame, CA 94010. Tel (415) 347-9693.

The Survival of Civilization ($12.00 ppd.) can also be ordered from John Hamaker, Hamaker-Weaver Publishers, Rte. 1 Box 1490, Seymour, MO 65746. (417) 935-2116.

Video

Stopping the Coming Ice Age video

Complete 57-minute version of the late Larry Ephron currently available from Lynne Ephron Sarafian, 406 1/2 Laurel Ave., Menlo Park, CA 94025. Tel. (415) 323-4034. The cost is $29.95, plus $3.50 for shipping and handling within the U.S.

The video is also available from *The Video Project, Films and Videos for a Safe and Sustainable World, Catalog 93* in an edited 45-minute version for $29.95. 5332 College Ave., Suite 101, Oakland, CA 94618. Call 1-800-4-Planet.

Earth Regeneration Society

Whose World To Lose?

This volume is the first government level document setting forth a structure for the climate stabilization effort. Place orders for one book or bundles of copies.

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Earth Regeneration Society is an active and effectively organized network, stimulating and coordinating initiatives in scientific research and both governmental and non-governmental policy. They have available numerous scientific papers on climate and are dedicated to the implementation of an Earth Regeneration Program. President, Alden Bryant and with Fred Wood Sr., Ph.D. and others. Earth Regeneration Society, 1442A Walnut St. #57, Berkeley, CA 94709.

Bread From Stones

The book by Dr. Julius Hensel and his pioneer writings from the 1890s on stone flour for agriculture, is now available from the ***Acres U.S.A.*** mail order bookstore. In addition to the classic text, *Acres U.S.A.*, has included comments by John Hamaker, among others. Softcover, 102 pages. Order No. 4024. Send $11 in U.S. and $12.00 outside U.S. (S & H included). *Acres USA*, P.O. Box 9547, Kansas City, MO 64133.

Superbiomin

Superbiomin with its 26 Mineral Elements for Human Beings, Animals and Nature, by Robert Schindele. This book is available from Robert Schindele and Co OHG, A-3122 Gansbach-Kicking, Austria. Tel. 02753/289.

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Sam Catalano of Pacific Mineral Development with his volcanic rock dust Min Plus in Queensland, Australia. See Story on page 26.

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